THE AMERICAN SCHOOL AND UNIVERSITY

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

1929–1930

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Foreword

By WILLIAM JOHN COOPER
United States Commissioner of Education

IN any business one expects to find the housing adapted to the processes that are to take place therein. To state so obvious a principle is easy; to realize its import, however, is very difficult. In the field of school buildings the problem has been complicated by lack of agreement on what constitutes real educational activity. At one time any room into which pupils could be crowded was accepted, and any sort of seat would do. After hundreds of thousands had suffered from inadequate or wrong light and from back-wrecking seats, school boards and architects discovered certain principles which should govern size and shape of room, location of windows, area of glass, etc. Seats also were improved in style, arranged in rows and fastened to the floor. When adults desired to use the school, provision had to be made for artificial lighting and frequently for seating of a new sort. Today many educators are demanding movable seating, and often much equipment in rooms used for elementary schools. The kindergarten has called for an entirely new conception of classroom.

Secondary schools are attempting to fit boys and girls of mental and social types never before in such schools to take their places in a machine civilization unique in the history of the world. Buildings to serve the purposes of secondary education must be as flexible as possible to meet changing theories and yet must meet certain specific requirements. The programs in health and physical education forced on the school by the urbanization of the population are illustrations of these. Consequently there will be much to be said and written on school buildings for several decades to come. Many articles in this volume give cross-sections of the situation. The authors show how given school housing and equipment problems have been satisfactorily solved.

SOLVING one problem, however, often creates several new ones. The crowded areas of cities require school buildings of large capacity. To be safe, these must be fireproof. This requires an investment of capital which must serve for many years. The building becomes at once, therefore, much more than a school building. It is a monumental building in the city. It is a part of the city itself. A realization of this has concentrated attention on the site, its area, shape, orientation, and landscaping. Several of the most interesting articles to be found in this volume deal with these problems.

The demands on the school for greater attention to health and physical activity are accurately reflected in the amount of space devoted to gymnasiums, field houses, playgrounds, etc. President MacCracken has supplied a splendid keynote chapter to this section of the volume.

AS the number of factors to be considered becomes a matter of general knowledge, no single architect, school superintendent, or school board will be expected to be proficient in the building and equipping of a school or college plant. In all building programs too small to warrant employing firms of archi-

tects specifically equipped to render expert service, it may be expected that some public body will be established to assist both school board and architect. There is little doubt that the state is the proper governmental unit to furnish such service, and several states now have divisions or bureaus of schoolhouse planning. The article on the subject is therefore most timely. Mr. Hill speaks with authority in this field.

THERE is no article in the volume that will not be of great value to some readers; many of them will be of dollars-and-cents value to every administrator of college and school; all of them will be worth while as indicating a stage in our solution of troublesome administrative problems; most of them will furnish inspiration to greater effort.

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Section I

SELECTING THE SITE AND PLANNING THE BUDGET

The Relation of School-Site Planning to Neighborhood Planning

BY CLARENCE ARTHUR PERRY

RUSSELL SAGE FOUNDATION

AT last there dawns the possibility of a proper and fairly permanent adjustment of school facilities to area and volume of service. That such adjustment is sorely needed in American cities requires little substantiation. A prominent student of educational administration sums up the matter in the statement, "Indeed it is extraordinary in any city to find the schools constructed prior to 1915 located in proper relationship to the population they are endeavoring to serve."[1] Thanks to Strayer and Engelhardt,[2] the requirements of a good school site have been thoroughly elaborated. But proper initial location is not enough. The population for which the school was designed must remain around it for a considerable period or the planning has been in vain. Too often it has been driven away by business or industry. The stabilization of residential areas is one of the main objectives of municipal zoning. In practice, however, this important procedure suffers from a defect that is inherent in its very nature. Necessarily, zoning operates to stabilize conditions which exist at the time it is laid down, and they are often faulty from the beginning. To be satisfactory, zoning must proceed concurrently with city planning; and the latter process, if it is to place school sites properly and permanently, must be able to employ a school district formula which is expressed in the terms of residential or subdivision planning.

Three [illegible]rs of Progress

Three recent developments work toward improved school-site planning. The first two bring city planning as a whole nearer to realization. However, since they are not specially concerned with school plots, they will only be mentioned.

1. A procedure covering subdivision control has been evolved and approved by a national group of realtors and by a nationally representative body of city planners. Its main principle provides for the preparation of master plans, "showing the location of main thoroughfares, recommendations for open spaces and designating land areas for specific uses."[3] To prepare such master plans, municipal planning commissions are recommended.

2. The essential features of this scheme are already in sight of realization in New York State through the recent enactment of certain city, village and town planning laws framed by Edward M. Bassett. These statutes are enabling acts, giving municipalities the power to establish main thoroughfares and open spaces, and to appoint permanent city planning boards.[4]

3. The publication of a scheme, or set of principles, whereby school-site planning is definitely related to residential planning. This scheme is referred to in the statement of principles regarding subdivision control issued by a special committee of The American City Planning Institute:[5]

> "The master plan should provide opportunity in the unbuilt areas, and if possible in the built-up areas, to create *neighborhood units* of varying size and character, which may be so far as possible self-contained as to community needs for schools, churches, shops, and recreation space."

A Formula for Planning Residential Areas

"Neighborhood unit" is the name which has been given to a special formula for the planning of residential areas. It is not a plan, but a "scheme of arrangement," which can be embodied by the planner, subdivider or architect in a wide variety of plans, suited to different conditions of terrain, population density and housing character.

The scheme is based upon the assumption that each distinct city area, or type of area, has special functions to perform. One section, for example, is the main "downtown" business area. It is divided

[1] Engelhardt, Fred.: "Population and School Planning."—THE AMERICAN SCHOOL AND UNIVERSITY, 1928-1929, page 73.

[2] Strayer, G. D., and Engelhardt, N. L.: "School Building Problems" and "Score Card for Elementary School Buildings."—Bureau of Publications, Teachers College, Columbia University.

[3] *Housing*, December, 1928, page 299.

[4] Regional Survey of New York and Its Environs, Vol. VII, "Neighborhood and Community Planning"; Part II, "Laws of Planning Unbuilt Areas," by Edward M. Bassett. 1929.

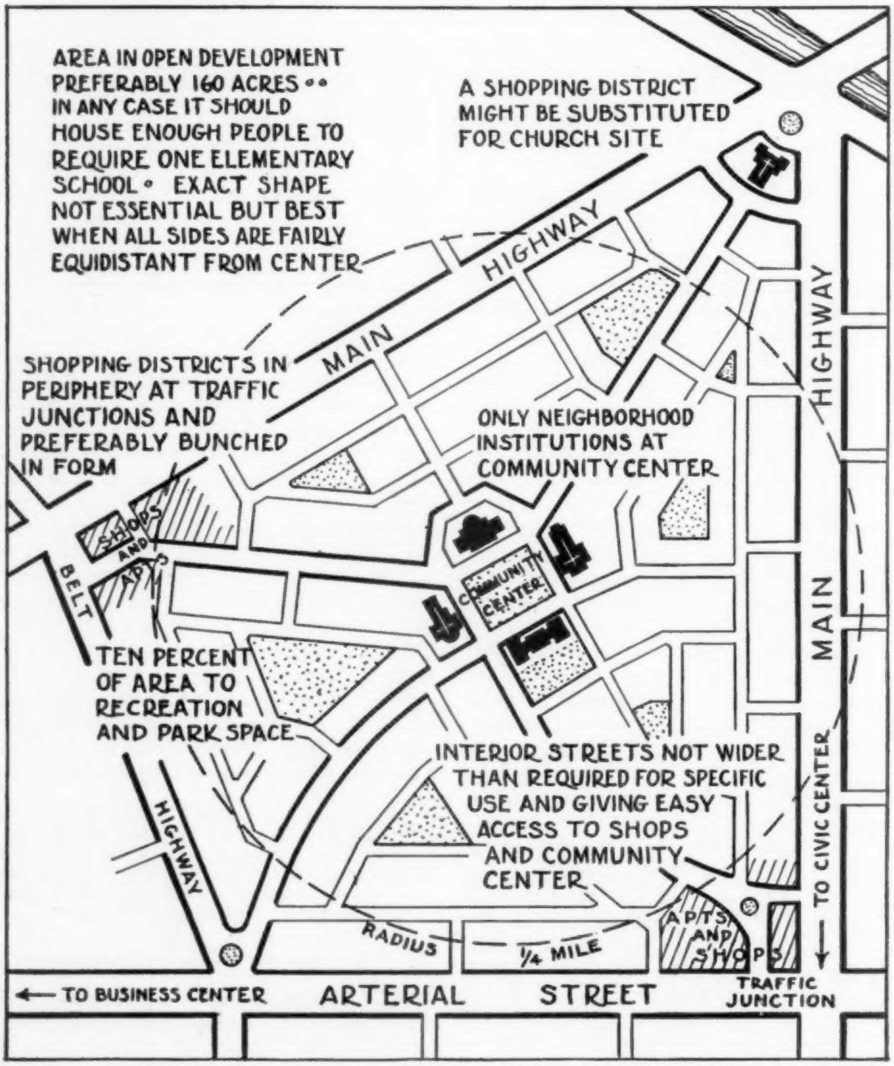
[5] THE AMERICAN CITY, July, 1928, page 109.

also into wholesale and retail districts which require different conditions as to location, character of streets and zoning. In the same way, residential sections, especially those devoted mainly to family life, have peculiar functions for which the city planner and zoner need to make provision.

What the average home-owner has a right to expect from the immediate neighborhood of his residence may be stated under four heads: (1) school facilities; (2) outdoor play spaces; (3) accessible local shops; and (4) residential character. The first three are services, operating with maximum efficiency in fairly definite spheres, and even the fourth has territorial limitations. The automobile has created another requirement—street safety—that affects all four functions.

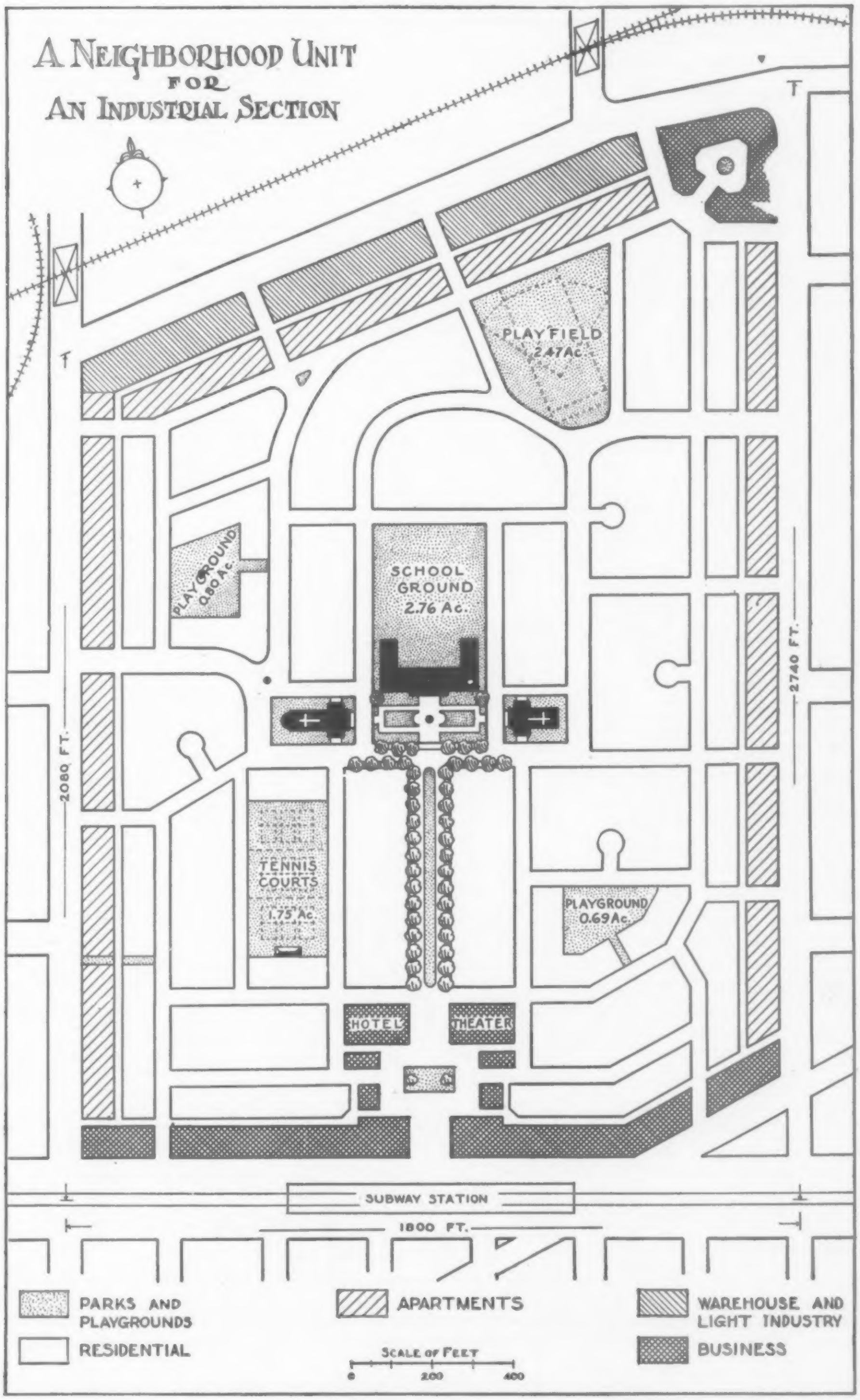
The only device by which the city planner can meet these requirements is obviously a district pattern that is adjusted to the dimensions of the various service spheres and meets the safety condition. Since the service requirements above mentioned are fundamental and apply to all classes of people, a district pattern which satisfies them can be regarded as a unit type and, by repetition, can be used in planning all the distinctly residential parts of a municipality.

The study of this subject which has been carried on under the auspices of the Regional Plan of New York and Its Environs, sets forth the following as the desirable specifications for the framework of a unit district planned for residential use.



A SUMMARY OF NEIGHBORHOOD UNIT PRINCIPLES

Its boundary highways invite through traffic, but its interior streets do not



A 100-ACRE TRACT DESIGNED FOR SINGLE, ROW AND MULTIPLE HOUSING, ACCOMMODATING 8,800 PEOPLE

A full description of this diagram is contained in Part III, Volume VII, Regional Survey of New York and Its Environs

A 160-ACRE SUBDIVISION FOR LOW-COST HOUSING, LAID OUT IN ACCORDANCE WITH NEIGHBORHOOD UNIT PRINCIPLES

A computed comparison of the cost of street improvements for the above plan and for the same tract laid out on traditional gridiron lines showed a saving in favor of the neighborhood plan of over $400,000. See THE AMERICAN CITY for March, 1927, page 287

NEIGHBORHOOD-UNIT PRINCIPLES [6]

1. *Size.*—A residential unit development should provide housing for that population for which one elementary school is ordinarily required, its actual area depending upon population density.

2. *Boundaries.*—The unit should be bounded on all sides by arterial streets, sufficiently wide to facilitate its by-passing by all through traffic.

3. *Open Spaces.*—A system of small parks and recreation spaces, planned to meet the needs of the particular neighborhood, should be provided.

4. *Institution Sites.*—Sites for the school and other institutions having service spheres coinciding with the limits of the unit should be suitably grouped about a central point, or common.

5. *Local Shops.*—One or more shopping districts, adequate for the population to be served, should be laid out in the circumference of the unit, preferably at traffic junctions and adjacent to similar districts of adjoining neighborhoods.

6. *Internal Street System.*—The unit should be provided with a special street system, each highway being proportioned to its probable traffic load, and the street net as a whole being designed to facilitate circulation within the unit and to discourage its use by through traffic.

School District Populations and School Sizes

It will be observed from the above that the size and shape of the neighborhood unit are those which are considered most desirable for an elementary public school district. In single-family-per-lot sections a subdivision of about 160 acres affords, at customary densities, a population of 6,000 people, among whom there would ordinarily be about 1,000 children of elementary school age. Strayer says that, except in sparsely settled districts, the desirable capacity for a modern elementary plant is from 1,200 to 1,600.[7] The leading school construction departments are still, however, preparing type plans for 800 pupil schools as well as for structures of greater capacities. On the basis of one pupil for every six residents, these figures suggest a population range of from 4,800 to 9,600 people. These figures could undoubtedly be stretched some on both ends, but whether the neighborhood unit is large or small, a fundamental requirement is that it be regarded and treated by the planner and zoner and school official as one elementary school district. No child, however, should have to walk more than one-half mile to reach school.

School Yards and Playgrounds Should Be Treated Concurrently

The unit scheme sets up the principle that, in making provision for recreation in a neighborhod community, the school yards and the playgrounds should be treated concurrently and in relation to each other. A certain central plot might afford a commanding school site and yet have only yard enough for the recess play of the smaller children. If one or more ample playgrounds were also available to the neighborhood boys and girls, the central school site could be used despite its smallness.

Again, both schools and playgrounds, for their best administration, need the support of voluntary associations composed of parents and teachers or workers. If the local recreation and education systems are related and serve identical areas, then one strong association can be developed which will cooperate with both services and render them both more efficient. A special neighborhood layout creates local consciousness and favors the growth of associations among the residents.

In the neighborhood unit, retail shopping districts are located on the fringe of the residential area they serve in such a way that accessibility is increased and blighting effect diminished. Since the unit principle makes it possible to fix the population maximum, the business frontage to be allowed can be accurately determined and permanently set by zoning. This means a great safeguard against the destruction of the school district by business incursions.

The Factor of Street Safety

In prescribing that the neighborhood unit should be entirely bounded and not penetrated by arterial highways, a considerable increase in street safety becomes possible. Under such conditions, families are able to reach school, playgrounds and shops —the three main destinations of children—without crossing streets devoted to through traffic.

In many other vital ways the interests of a school district and of a neighborhood community coincide. Neither set of interests can be adequately met in city planning by separate and unrelated treatments. The school that serves two heterogeneous and uncommunicating local communities is handicapped in its work, and neither group of people is in a position to help the school develop in conformity with its own needs and standards.

The neighborhood unit, as respects area and population, is determined by whatever is considered desirable for the school district. The effect of all its other provisions is to mold the residents into one cooperating community, enjoying exceptional safety in streets, ample recreation and shopping facilities, and, because of these advantages, developing a healthy, civically important locality consciousness.

[6] Regional Survey of New York and Its Environs, Vol. VII, "Neighborhood and Community Planning"; Part III, "The Neighborhood Unit," by Clarence A. Perry. 1929.

[7] Strayer, G. D.: "Planning School Buildings to Meet Future Needs." THE AMERICAN SCHOOL AND UNIVERSITY, 1928-1929, page 14.

EDITORIAL NOTE.—The three diagrams illustrating this article are used by courtesy of the Regional Plan of New York and Its Environs.

School-Building and Sites Programs

BY W. W. THEISEN

ASSISTANT SUPERINTENDENT OF SCHOOLS, MILWAUKEE, WIS.

SUCCESSFUL business men have long accepted the principle that the demands likely to be made on a concern must be anticipated well in advance of the actual demands. They have learned to anticipate future needs in terms of plant equipment, staff, and product or service, with commendable exactness, and it is only by so doing that they are able to meet the situation when the time comes. An army staff is far more concerned over the probable future than it is with the present, for the security of a nation is likely to depend upon the accuracy of its plans for coping with any emergency even remotely possible. School executives have not always exhibited the same foresight which one finds in the executive staff of a successful business concern or an army. Only within comparatively recent years have we heard anything about scientific planning in the case of school facilities.

As mute evidence of this lack of careful planning, we find everywhere buildings which when judged by any reasonable criteria are found to be poorly located geographically, on cramped and inadequate sites, poorly designed and administratively inefficient and impractical. Not infrequently these buildings bear a ward label, as further evidence, if such were necessary, that political rather than educational considerations dictated their location and construction. Since the advent of the survey movement in education and the development of better standards of schoolhouse construction, much progress has been made. The conditions pointed out by Terman, Ayres, Strayer and others in the earlier surveys, and the standards proposed in their reports, did much to focus attention on school-building problems. From the standpoint of the superintendent, the survey frequently left much to be desired. The programs proposed, while representing what in the most expert judgment was really needed, meant such an abrupt change over previous local policies that they were not always accepted by the local clientele. Moreover, the surveyors could not remain on the ground long enough to carry out the slow process of "selling" the program, with all of its implications, to the public, nor could they exercise that constant watchfulness necessary to keep the board of education from lapsing into a state of lethargy or advancing its own notions as to what to do and what not to do.

Continuous Surveys or Frequent Re-surveys

More recently cities have tended in their school-building programming to provide either for a continuous survey or for a re-survey at frequent intervals. By means of such continuous or frequent re-surveys, many of the objections to the older-type survey have been removed. They have been marked by more actual accomplishment and less blaring of trumpets. The continuous survey, while making unnecessary either such sudden increases in buildings and expenditures, or intensive publicity campaigning, has been able to maintain constantly before the eyes of the board and the public a picture of immediate and future school needs and to let them see evidence of progress. This type of survey has the further advantage of providing a frequent rechecking of its own calculations and proposals.

The present Milwaukee policy is an illustration of an attempt at a continuance or frequent re-survey. Since 1923, when Superintendent Milton C. Potter first appointed a survey committee, the Board has at all times followed a definite building and sites program as a basis of procedure. The program has undergone revision, as all such programs must. No committee can do more than to make the most careful estimates of future needs, based upon the data it is able to gather. Unforeseen developments are likely to take place in certain sections, while others develop less rapidly than at first anticipated. Annexation activities, in particular, may cause troublesome problems. For example, the citizens of the suburb of North Milwaukee had voted overwhelmingly in favor of annexation to the city of Milwaukee in 1922. The survey committee of 1923 took cognizance of this fact. The actual annexation is just now being completed, six years later. Two other suburbs, West Allis and Wauwatosa, through their attempts to annex territory for which the Milwaukee Board had already formulated a program, have added to the burdens of the program makers by forcing them to make revisions accordingly.

Building the Program Around Existing or Contemplated Educational Policies

Any program of schoolhouse construction must be built around existing or contemplated educational policies. The only function of a schoolhouse is to provide a place where children may be given the type of educational training we want them to have, under approved conditions of health, safety, economy, and teaching efficiency. This means that a school should be built with the type of curriculum to be offered and the form of administrative organization to be employed clearly in mind. Such factors as expected increases in enrollment, size of school desired, size of classes, the ages of groups to be accommodated, the grades to be taught, the subjects to be offered, the proportion of elective and required work, or pe-

culiar legal requirements (as in the case of the requirement of 250 minutes per week of physical training in Wisconsin) have a decided bearing on the building program.

If any radical changes in educational policy are to be made, the school-building and sites program proposed must be revised accordingly. A platoon system of organization, for example, would greatly alter the situation in terms of the number of buildings needed, their location, their general plan of construction, and the amount of money required. With a platoon or rotary type of organization, fewer buildings are needed for the same number of children.

A real difficulty presents itself, however, when a board has nó established policy with reference to some desirable form of educational activity or administrative organization. In such cases the program makers must consider the merits of such matters and the trend of their development throughout the educational world, and make recommendations accordingly, depending upon their ability to secure a wholehearted acceptance of the proposal from the public. The problem of junior high schools in Milwaukee is an illustration of what sometimes happens. In the absence of an established Board policy, the 1923 survey committee was somewhat baffled in knowing how far it might go in mapping out a five-year building and future site program. Observing the general trend of junior high school development throughout the nation, however, and foreseeing the probable trend in Milwaukee, the committee recommended a building program of which junior high schools formed an integral part. While the Board has never formally committed itself to a policy of junior high school development, it has proceeded with the erection of junior high schools recommended by the Survey Committee of 1923 and subsequent committees. Since 1923 two large junior high schools have been built and occupied, a third is under construction, as is also a new six-year high school, a fourth is operating in temporary quarters, junior departments have been added to two other high schools, and several sites for future needs have been purchased. The Board has therefore tacitly endorsed the junior high school without taking any formal action on the subject.

Studying Population Trends

Provision of adequate school facilities for any growing city requires a constant study of the population trends. While school membership is not directly determined by population, because of variations in the proportion attending school, it is, however, the most important factor influencing it. The first step, therefore, in anticipating future school needs is the forecasting of the future population, however difficult this may be. Any forecast, at best, will be only an estimate. But an estimate which takes into consideration all of the known factors is likely to be far nearer the truth than one which overlooks important ones. Those responsible for the formulation of a building program should endeavor to forecast future population, using as many different types of data as possible in making predictions. Various aids have been used by surveyors, such as past trends shown by the Federal and school census, school enrollment, birth statistics, immigration, the number of registered voters, real estate growth, and developments in various forms of public service.

The reliability of an estimate of future population based upon past trends is, however, contingent upon the continuance of such trends in the future. Unusual fluctuation in commercial and industrial prosperity, such as might be produced by the discovery of a new source of wealth, or industrial paralysis, will upset any calculation. The unexpected annexation of a suburban community will have a noticeable effect. While the trends in the various lines mentioned above have been used at various times, the ones that have proved as dependable as any are those of large industrial concerns, such as the American Telephone and Telegraph Company, which make a business of studying systematically the possibilities and probabilities of development in the various sections of a city.

It is not sufficient, however, to know the most likely future total population, for population is after all only a crude index of probable public school enrollment. School membership depends upon the child population and the tendency of parents to send that population to school. In recent years there has been a very marked increase in many cities in the proportion of children remaining in school for the upper grades. During the school year 1912-13 the city of Milwaukee had 11.1 per cent of its population in the public school. By 1927-28 the number had increased to 13.4 per cent. In 1922-23 those enrolled in grades above the sixth represented 31.1 per cent of the total enrolled, while in 1927-28 they numbered 36.6 per cent. Even more striking evidence of the increasing tendency to remain in school is shown by the changes in grades nine to twelve. As late as 1922-23 only 14.6 per cent were enrolled in these grades. By 1927 the figure had increased to 17.6 per cent, and at the present writing it has passed the 20 per cent mark. A study of enrollment increases over 1922-23 shows that while the numbers in grades below the seventh were increasing 34.6 per cent, those in grades seven to nine inclusive increased 232.4 per cent and those in grades ten to twelve 389.2 per cent. These figures go to show why it is that school enrollment has been increasing more rapidly than population. Such changes have a decided bearing upon building programs, for they mean that a community must not only expect to provide for increasingly large numbers of pupils per thousand of total population, but it must expect the building cost per pupil accommodated to be higher.

A study of large group increases does not tell us where schools should be located. This can only be determined by an analysis of the various sections of a city, for each of them constitutes a problem in itself. The problem for the

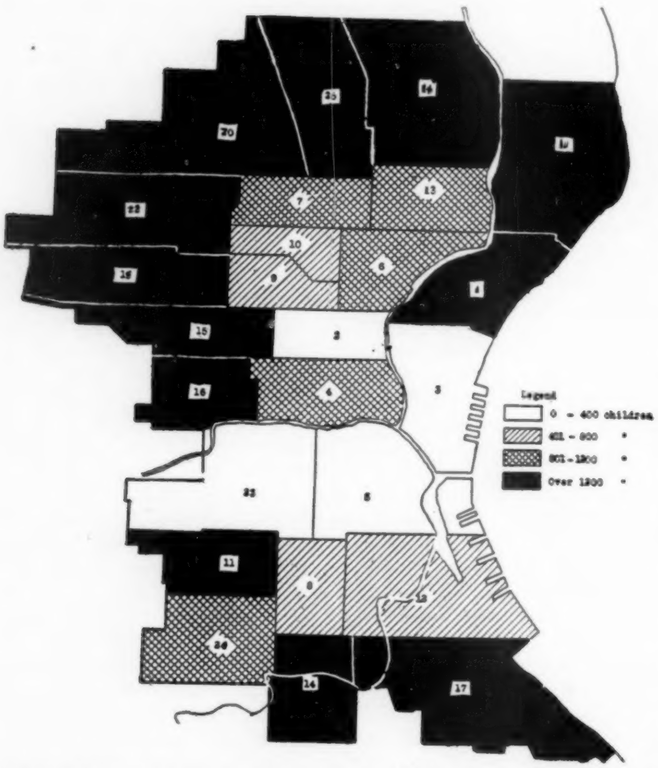


CHART SHOWING PREDICTED INCREASE IN NUMBER OF MILWAUKEE SCHOOL CHILDREN IN VARIOUS WARDS BY 1933

program makers is to determine just where growth will take place. Zoning restrictions, areas most likely to become residential or industrial, the type of homes likely to be built in a given area, the percentage of land occupied, the tendency of certain racial and national groups to replace others in a particular area, the tendency of the population to get away from the business center or to locate near good transportation lines, all need to be considered. The accompanying chart shows what may be expected when various divisions of a city are analyzed separately.

The Financial End of the Program

Having determined the necessary program in terms of pupils' accommodations, the financial end of the program must be considered. How much money will be needed annually? How much of it can be raised under present restrictions? What legislation will be necessary? What are the relative merits of the various possible means of financing the program? In a small community where a new building may be erected only once in twenty years or more, a bond issue is undoubtedly proper. In a large and growing city the situation is different. New buildings are needed each year and should be paid for as they are built. Only in case a city has fallen far behind in its building activities or has a large outstanding school debt, should it have occasion to resort to bonds. Few communities can switch abruptly from a bond to a cash basis, for that would involve a double burden during the years unpaid bonds were maturing.

Whatever the annual community bill is to be, the program makers and the board should make the fact known to the public promptly. If $100,000, or $1,000,000, will be needed annually, that fact should be made known so the public may prepare to meet it. Better still, the amount should be translated into terms of its cost to the average citizen. An additional expenditure of three cents per day, or the price of one daily newspaper, to provide one's children with adequate school facilities seems relatively little, but a proposal to spend $1,000,000, which no one actually pays, is likely to seem excessive.

The greatest care is needed in estimating the amount of money required, for the chances of error are great. Errors are very easily made both in the program itself and in the estimated cost of various items in the program. In the case of proposed sites, for example, the estimated cost may be correct *at the time the estimate is being made,* but if the board delays in purchasing, the *actual* cost is likely to be far in excess of the estimated costs. Many communities have found building prices rising before contracts could be let. Again, the building may be made larger or provision made, under local pressure, to include accommodations for certain activities not contemplated by the program makers. As a result, building budgets have had to be revised upward rather than downward. The program makers must guard against such contingencies as far as possible and make allowances accordingly. On the other hand, they must not appear to be radical or extravagant. The program proposed should be one they feel in all sincerity the community can afford and will accept if properly presented. They should not hesitate, however, to point out any additional building or land purchases that would be highly desirable were funds available. The taxpayer should be made to see that the program makers have endeavored to exercise good business judgment and common sense in their requests.

Publicity of the Right Kind

The formulation of a building program covering a period of years is only the first of four major steps in the direction of adequate schoolhousing facilities. At least three others remain to be taken. The second requires publicity of the right kind. No progressive superintendent or

board can hope to win and hold the support of the public without a parallel program of publicity. While intensive publicity campaigns are often necessary when programs requiring unusual and unexpected increases in expenditures are proposed, many communities find that the best results are to be had from a continuous publicity program or a combination of the two. The good work being done by the schools, and the steps necessary for their improvement, should be pointed out continually and in every possible form. The board itself must be given attention. A superintendent is wise in taking the members of his board on a tour of building inspection. Let them see unsatisfactory and inadequate housing conditions for themselves, and by all means let them feel that the proposed program of relief is their program. When the board and the public both understand fully that there is an accepted program for solving the school-housing difficulties of the district, and that in due course of time all sections will be cared for, order of urgency being the prime consideration, the most important battle is won. At no time, however, must they be allowed to forget that such a program exists.

Adhering Closely to the Program

The third of the major steps concerns the carrying-out of the program in actual practice. A program must come to mean something more than a paper program. Its provisions must be observed with a respect equal to that accorded the law. The superintendent and his staff must themselves respect the program and do their utmost to prevent unwarranted departures. Every community is likely to harbor groups whose selfishness leads them to approach board members with a view to securing some changes in the program. It is only by close adherence to program that systematic and orderly progress may be expected.

To carry out a building and sites program such as is found in the larger cities requires not only money, but a staff of considerable size. For example, if sites are to be purchased, there must be some one to perform the actual details of buying. The present availability of desirable tracts must be ascertained, options secured or condemnation proceedings instituted. Sites programs sometimes suffer because no one is assigned to do this work. For such lack of aggressive action, boards must often pay out thousands of dollars in increased cost when the actual purchases are made. Besides, they are frequently compelled to accept inferior and less desirable tracts of land than would have been necessary had prompt action on the recommendations of the program makers been taken. In addition to the work which the educational staff must perform in recommending action on particular buildings, the appropriation of the necessary funds, and outlining educational specifications for the building, there must be provision for competent architectural, engineering and inspection service. Some boards prefer to engage architects on a competitive basis. A more desirable practice seems to be to engage an architect of recognized competence and require him to prepare plans in accordance with the detailed educational requirements laid down by the superintendent.

Keeping the Program Up to Date

The fourth major step is to keep the program up to date. A five-year program, for example, is no longer a five-year program at the end of the first year, but only a four-year remnant. If the board is to have before it, at all times, a complete five-year program, provision must be made for projecting it an additional year into the future each year. This is the plan followed in Milwaukee where the annual revision policy is in effect. Surveys and re-surveys have been made in 1923, 1924, 1925, 1927 and 1929.

Such frequent revisions not only keep the program projected well into the future and tend to provide continuous publicity material, but permit necessary rechecking for accuracy of predictions and meeting unforeseen developments. Re-affirming of the findings of previous committees has the effect of strengthening such recommendations and developing a feeling of confidence in the good judgment of the program makers.

The frequent re-survey in Milwaukee has apparently tended to compel the Board to "stick to its knitting." Board members have not, as so often happens, presented their own proposals for new buildings. They have been able to meet any requests by interested outside parties for action on a matter of building or sites purchases with the query: "Is it on our program?" Or again, such parties would be answered by the statement: "Yes, we have already made provision for it in our five-year program, but we shall not have the necessary funds before 1931, at the very earliest. There are several other items on our program that are more urgent and must come ahead of it."

How closely the Board has adhered to its program may be noted from the fact that, of the seventeen items of building construction provided in the five-year program formulated in 1923, all but four were being carried out by 1928. In all but one of these the need for action had not developed as rapidly as the program makers had anticipated. Of the thirty-two projects on the 1927 revision of the five-year program, seven of the first ten were completed or under way by the end of the year 1928. The twelfth item on the program was also under way, having been advanced because of rapid growth in that section of the city. Such close adherence by the Board to a program, we believe, represents a commendable regard for the professional judgment of its executive staff, who were largely responsible for preparing the program.

Methods of Computing and Comparing School-Building Costs

BY HERBERT N. MORSE

ASSISTANT COMMISSIONER OF EDUCATION FOR NEW JERSEY

AND

CHARLES D. ANDERSON

STATE STATISTICIAN

THE question of providing new school buildings faces every community at some time. The expense involved is usually a paramount issue in every community when this question arises. School-building construction costs are greater today than in the past, and every indication is that they will go higher, although building costs are becoming stabilized. This greater cost is mostly due to the fact that our present education program demands a greater variety of special facilities than formerly.

The great expenditure of money on school-building construction demands careful and economical planning. When a school system plans a school building, the first essential is the formulation of an educational program to fit the needs of the community, not only for the present, but for the future. Many school buildings have been and are being erected without any consideration of the present or future educational program. It is poor judgment to make a program fit an ill-adapted school building, yet many school men are forced to do so.

The second essential in planning a school building is that of economy. Every facility should be utilized to its maximum; otherwise it should not be provided. There is great waste of space in many school buildings. In new buildings this surplus space should be eliminated as much as possible. Simplicity in architectural design is greatly desired. Excessive school-building cost is due to a large extent to waste space and ornamentation.

In order to determine in a general way what a new project should cost, a Board of Education naturally turns to other communities that have recently constructed buildings of the type to meet their needs. This logically brings about comparisons.

Factors Which Affect Costs

In comparing school-building costs a number of factors must be taken into consideration. Some of these factors are type of school (elementary, junior high, senior high, vocational or special), type of construction, special facilities, size and geographical location. The type of school is an important factor, because it usually costs more to erect a modern high school building than it does to erect a modern elementary building. Type of construction is important, because a fire-resistive building costs more than a semi-fire-resistive building of the same size and in the same community. The greater the number of special facilities, the greater the cost of the school building. Size of building is important, because size of building determines to a large extent the type of construction. It costs more to erect a school building of the same material, type, and cubiture in the metropolitan districts than in the more sparsely settled sections.

Three Methods of Determining Unit Costs

Comparisons in regard to school-building costs can be made only on the basis of unit costs, and not on the basis of total costs. In New Jersey, we recognize three methods of determining unit costs, namely, per pupil based on the maximum pupil capacity, per square foot of usable floor space, and per cubic foot.

The maximum pupil capacity in a school building will vary according to the educational system used or type of school housed. If the platoon system is used, the maximum pupil capacity of a building would be materially increased. Therefore, real comparison of unit costs on this basis cannot be made. Comparison on this basis with other states would not be possible, because in New Jersey the standard is 18 square feet of floor space per seat, while in many of the states the standard is 15 square feet of floor space per seat.

The number of square feet of usable floor space is the best factor to use in determining the unit costs of school-building construction, providing the factors are the same. In New Jersey the number of square feet of usable floor space is determined by adding the areas of all classrooms, auditoriums, gymnasiums, swimming pools, shower and locker rooms, offices, teachers' rooms, libraries, laboratories, toilet-rooms and all special rooms. This does not include corridors, stairs, boiler-rooms, janitors' rooms, storerooms or cafeterias unless cafeterias are used as study rooms or for classroom purposes. Using this formula, comparisons can be readily made.

The third method of determining unit costs is based on the cubical contents of the building. In making comparisons of school-building costs on this basis, it is necessary to adopt a uniform method of computing the cubical content. There are a great number of methods used by the various architects. The formula given below has been accepted by the State Department of Public Instruction.

The New Jersey Formula

1. Multiply the area of the first floor by the height of the building from the underside of the basement floor to the mean of the roof.

In order to arrive at the height of the building, add the height from the underside of the basement floor to the lowest point of the roof and the height to the highest point, and divide the sum by two. The area of first floor is to be taken at the outside of exterior walls. Deduct all recesses which are the full story height.

2. In buildings whose basements are not entirely excavated, multiply the area of the first floor by the height of the building from the underside of the first floor to the mean of the roof. To this content add the cubical content of any space between the underside of the first floor and the surface of the excavation, and in addition add the cubical contents of any partial basement which may be found in the building.

3. When portions of the building are built to different heights, each portion is to be taken as an individual unit.

4. Projection entrance porches are not to be included.

5. Porches, covered verandas used for school activities, and open-air rooms and auditoriums are to be included.

In finding school-building costs, one of the most important considerations is the cost of providing schoolrooms for the performance of regular school work. Using only one type of unit costs will not present the true facts. The cost per cubic foot may be low, although the cost of such building may be excessive from the utilitarian point of view. Therefore, it is desirable to use other unit costs in addition to unit costs based on cubical content to give a better picture of the cost of any building. The value of unit construction costs will be greatly improved if descriptions in sufficient detail accompany such unit costs. Comparing school-building unit costs on the three bases mentioned will tend to eliminate excessive cost due to ornamentation and surplus or unnecessary space. Comparisons between school buildings on the basis of the number of square feet of usable floor space and number of cubic feet per pupil will indicate whether economy has been practiced or not in the construction of any building.

Comparative Data for 228 School Buildings

Many school boards and school officials who were considering school-building construction desired information on school buildings. As a result of this desire it has become the policy of the New Jersey State Department of Public Instruction to collect and publish from time to time the descriptions and cost data of all school buildings constructed since 1921. These facts were obtained from questionnaires sent to school districts upon the completion of new school buildings.

Up to the present time the descriptions and cost data of 228 school buildings have been published. Of this number, 53 were junior or senior high schools, and 175 were elementary schools.

Comparative median unit costs per pupil and per square foot and median number of square feet per pupil of school buildings constructed in New Jersey since 1921 are shown in the following tables according to type (elementary, junior and senior high schools), construction (fire-resistive, semi-fire-resistive and frame) and number of classrooms.

ELEMENTARY SCHOOL BUILDINGS

Buildings	Median Cost Per Pupil	Median Cost Per Square Foot	Median Number of Square Feet Per Pupil
All	$301.05	$10.25	28.0
Fire-resistive	344.64	12.12	30.2
Semi-fire-resistive	288.45	10.46	28.4
Frame	102.96	5.21	19.2
One-room	81.19	4.80	18.0
Two-room	146.00	7.58	20.2
Three-room	115.56	5.79	20.2
Four-room	251.40	11.05	23.3
Five-, six- and seven-room	284.16	9.01	29.0
Eight-room	302.97	11.85	25.9
Nine-, ten- and eleven-room	325.23	10.35	34.6
Twelve-room	355.31	12.43	34.4
Thirteen-, fourteen- and fifteen-room	344.64	11.97	32.7
Sixteen-room and over	403.59	12.27	32.4

HIGH SCHOOLS

Buildings	Median Cost Per Pupil	Median Cost Per Square Foot	Median Number of Square Feet Per Pupil
All	$508.00	$11.39	43.6
Fire-resistive	542.38	12.91	43.6
Semi-fire-resistive	365.77	8.04	40.0
Senior high school	542.54	11.85	44.3
Junior high school	441.12	11.90	41.5
Combination elementary and senior high school	303.71	7.44	41.2
Nine classrooms or less	545.11	9.16	45.0
Ten to fifteen classrooms inclusive	542.70	11.56	36.6
Sixteen to nineteen classrooms inclusive	485.59	10.06	44.0
Twenty or more classrooms	518.94	12.68	42.3

Descriptions and Cost Data for Fifteen Typical Schools

Fifteen typical examples of detailed descriptions and cost data for school buildings of various sizes and types which have been published by the New Jersey Department of Public Instruction are given below. Three examples each are given for high schools, junior high schools, elementary schools of four classrooms, eight or nine classrooms, and nineteen classrooms or over. A careful study of the school-building descriptions and cost data as published are of value to boards of education and school officials who are contemplating construction and as a deterrent in extravagant school-building costs. It will be noticed in the examples given that there are wide variations in unit costs.

(A) High School—Construction started September 1, 1922; completed February, 1924. Size of site, 230 x 350 feet. Cost, $2,477.85. Building is of two stories, brick exterior and of fire-resistive construction. Contains twenty-two classrooms, auditorium, gymnasium shower and locker rooms, offices, teachers' rooms, school library, lunch-room and kitchen, manual training and domestic science rooms, laboratories and toilet-rooms. The area of the above room is 30,782

square feet. Maximum pupil capacity, 750. Cost of building, exclusive of equipment, is $251,084.43. Cost of equipment is $22,935.54. Total cost of school plant is $276,497.82. Building cost per pupil is $334.78, and per square foot, $8.16. Number of square feet per pupil, 41.0.

(B) High School—Construction started July, 1924; completed, 1927. Size of site, 330 x 525 feet. Cost, $94,565.43. Building is four stories in height, with brick and limestone exterior and of fire-resistive construction. Contains thirty-eight classrooms, an auditorium, two gymnasiums, shower and locker rooms, offices, teachers' rooms, library, manual training and domestic science rooms, laboratories, toilet-rooms, medical and dental rooms, typewriting room, bookkeeping room, fine arts room and cafeteria. The area of the above rooms is 51,842 square feet. Maximum pupil capacity, 1,185. Cost of building, exclusive of equipment, is $861,814.65. Cost of furniture and equipment, $120,000. Total cost of school plant is $1,076,-380.08. The building cost $727.27 per pupil and $16.62 per square foot. Number of square feet per pupil is 43.7.

(C) Senior High School—Construction started October, 1921; completed June, 1923. Size of site, 300 x 490 feet. Cost, $350,000. Building is four stories in height with brick exterior and of fire-resistive construction. Contains eighty-two classrooms, an auditorium, gymnasiums, swimming pool, shower and locker rooms, offices, teachers' rooms, library, manual training and domestic science rooms, laboratories, toilet-rooms, medical and dental rooms and drill-rooms. The area of the above rooms is 115,152 square feet. Maximum pupil capacity, 2,526. Cost of building, exclusive of equipment, is $1,556,084.90. Cost of furniture and equipment, $206,017.57. Total cost of school plant is $2,112,102.47. The building cost $616.03 per pupil and $13.51 per square foot. Number of square feet per pupil is 45.6.

(D) Junior High School—Construction started March 1, 1923; completed September 1, 1925. Size of site and cost not given. Building is of three stories with brick exterior and of fire-resistive construction. Contains seventeen classrooms, an auditorium, gymnasium, shower and locker rooms, offices, teachers' room, school library, manual training and domestic science rooms, art room, sewing room and toilet-rooms. The area of the above rooms is 35,716 square feet. Maximum pupil capacity, 584. Cost of building, exclusive of equipment, $496,242.59. Cost of equipment, $31,142.95. Total cost of school plant, $527,385.54. Building cost per pupil is $849.73, and per square foot is $13.89. Number of square feet per pupil is 61.2.

(E) Junior High School—Construction started June, 1925; completed September, 1926. Area of site, 7.4 acres. Cost, $36,000. Building is three stories in height, with brick exterior and of fire-resistive construction. Contains twenty-seven classrooms, an auditorium, a gymnasium, shower and locker rooms, offices, teachers' rooms, library, manual training and domestic science rooms, laboratories, toilet-rooms, medical and dental rooms, conservatory and lecture room. The area of the above rooms is 40,502 square feet. Maximum pupil capacity, 1,000. Cost of building, exclusive of equipment, is $440,802.98. Cost of furniture and equipment, $46,364.02. Total cost of school plant is $523,167. The building cost $440.80 per pupil and $10.88 per square foot. Number of square feet per pupil is 40.5.

(F) Junior High School—Construction started July 3, 1924; completed April 9, 1926. Area of site, approximately eight acres. Cost, $92,744.97. Building is of three stories, brick and stone exterior and of fire-resistive construction. Contains fifty-two classrooms, an auditorium, boys' gymnasium, girls' gymnasium, swimming pools, shower and locker rooms, offices, teachers' rooms, school library, manual training and domestic science rooms, laboratories, toilet-rooms, cafeteria, and medical and dental rooms. The area of the above rooms is 94,448 square feet. Maximum pupil capacity of building is 2,274. Cost of building, exclusive of equipment, is $1,324,471.95. Cost of equipment, $172,071.61. Total cost of school plant is $1,589,288.53. Building cost per pupil is $582.44, and per square foot is $14.02. Number of square feet per pupil is 41.5.

(G) Elementary School—Construction started May, 1926; completed January, 1927. Size of site, 210 x 310 feet. Cost, $4,995.74. Building is one story in height, with brick exterior and of semi-fire-resistive construction. Contains four classrooms, an auditorium and toilet-rooms. The area of the above rooms is 6,893 square feet. Maximum pupil capacity, 160. Cost of building, exclusive of equipment, $45,466.93. Cost of furniture and equipment, $1,455.15. Total cost of school plant is $51,917.82. The building cost $284.17 per pupil and $6.73 per square foot. Number of square feet per pupil is 43.1.

(H) Elementary School—Construction started August 6, 1924; completed July 6, 1925. Area of site, five acres. Cost, $2,500. Building is of one story, brick exterior, and of semi-fire-resistive construction. Contains four classrooms, auditorium, teachers' room, and toilet-rooms. The area of the above rooms is 5,116 square feet. Maximum pupil capacity is 160. Cost of building, exclusive of equipment, is $48,286.14. Cost of equipment is $3,714.00. Total cost of school plant is $54,500.14. Building cost per pupil is $301.79, and per square foot is $9.44. Number of square feet per pupil is 32.0.

(I) Elementary School—Construction started October, 1926; completed August, 1927. Size of site, 400 x 400 feet. Cost, $20,276.76. Building is two stories in height, with brick exterior and of fire-resistive construction. Contains four classrooms, teachers' room and toilet-rooms. The area of the above rooms is 3,435 square feet. Maximum pupil capacity, 120. Cost of building, exclusive of equipment, is $70,720.65. Cost of furniture and equipment, $2,277. Total cost of school plant is $93,274.41. The building cost $589.33 per pupil and $20.59 per square foot. Number of square feet per pupil is 28.8.

(J) Elementary School—Construction started February 25, 1925; completed January 29, 1926. Size of site and cost not given. Building is of two stories, brick and stone exterior, and of semi-fire-resistive construction. Contains eight classrooms, auditorium, shower and locker rooms, office, teachers' room and toilet-rooms. The area of the above rooms is 10,759 square feet. Maximum pupil capacity is 280. Cost of building, exclusive of equipment, is $108,093. Cost of equipment is $4,126.23. Total cost of school plant is $112,-219.23. Building cost per pupil is $386.05, and per square foot is $10.05. Number of square feet per pupil is 38.4.

(K) Elementary School—Date construction started and completed not given. Size of site not given. Cost, $11,000. Building is two stories, brick exterior, and of fire-resistive construction. Contains eight classrooms, auditorium, office, teachers' room, medical and dental room and toilet-rooms. The area of the above rooms is 9,364 square feet. Maximum pupil capacity is 320. Cost of building, exclusive of equipment, is $158,-026.63. Cost of equipment is $6,000. Total cost of school plant is $175,026.63. Building cost per pupil is $493.83, and per square foot is $16.88. Number of square feet per pupil is 29.3.

(L) Elementary—Construction started December, 1924; completed November, 1925. Size of site,

561 x 467 x 593 x 453 feet. Cost, $19,000. Building is of one story, of brick exterior, and semi-fire-resistive construction. Contains nine classrooms, auditorium, gymnasium, shower and locker rooms, offices, teachers' rooms, school library, manual training and domestic science rooms, medical and dental room, lunch-room, kitchen and toilet-rooms. The area of the above rooms is 20,537 square feet. Maximum pupil capacity is 432. Cost of building, exclusive of equipment, $228,291.78. Cost of equipment is $15,069.94. Total cost of school plant is $262,361.72. Building cost per pupil is $528.45 and per square foot is $11.12. Number of square feet per pupil is 47.5.

(M) Elementary School—Construction started June, 1925; completed July, 1926. Area of site, 137,500 square feet. Cost, $15,000. Building is of two stories, with limestone and brick exterior and of fire-resistive construction. Contains twenty-one classrooms, an auditorium, a gymnasium, locker room, office, teachers' room, manual training and domestic rooms, drawing room, play court, toilet-rooms, medical and dental room. Area of the above rooms is 26,831 square feet. Maximum pupil capacity is 840. Cost of building, exclusive of equipment, is $358,000. Cost of equipment, $25,000. Total cost of school plant, $398,000. Building cost per pupil is $426.19, and per square foot is $13.34. Number of square feet per pupil is 31.9.

(N) Elementary School—Construction started September, 1925; completed July, 1927. Size of site, 213½ x 225 feet. Cost, $37,030.66. Building is three stories in height, with brick exterior and of fire-resistive construction. Contains twenty-three classrooms, an auditorium, a gymnasium, shower and locker rooms, offices, teachers' room, library, manual training and domestic science rooms, toilet-rooms, medical and dental rooms, cafeteria, drill-room, and drawing room. The area of the above rooms is 39,765 square feet. Maximum pupil capacity, 920. Cost of building, exclusive of equipment, $638,975.29. Cost of furniture and equipment, $36,848.47. Total cost of school plant is $712,854.42. The building cost $694.54 per pupil and $16.07 per square foot. Number of square feet per pupil is 43.2.

(O) Elementary School—Construction began August, 1920; completed April, 1922. Building is four stories, brick exterior, fire-resistive construction. Contains forty-one classrooms, auditorium and rooms for offices, teachers, manual training and domestic science and toilets. Capacity, 1,520 pupils. Size of site, 200 x 136 feet. Cost, $118,650. Cost of building, exclusive of furnishing, $1,891,-061.20. Building cost per pupil, $1,244.12. Square feet of building used by pupils, including offices and teachers' rooms, 42,264. Cost per square foot, $44.74. Square feet per pupil, 27.

System and Efficiency in Purchase of Supplies

BY JOHN B. WYNKOOP

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THE business of purchasing school supplies smacks of both an art and a science. It is kin to an art, in that it involves a number of intangible elements—a nice sense of discrimination between values, a well-balanced judgment in dealing with human personalities, a sensitivity to the ethical proprieties of business. It is somewhat a science in its demand for accurate knowledge, its dependence on objective standards, its impersonal attitude toward money spent and value received.

In general, the business is looking up. Fair dealing and a resultant mutual confidence between buyer and dealer justify a spirit of optimism. The day of the "Buyer Beware" slogan has passed. Keen competition in modern trade has eliminated inferior goods to a minimum, and the seller rarely appears in a reputable market representing any but a high-class manufacturer with a correspondingly high-grade commodity, the true value of which the agent sets forth without fear or favor. The public school is no longer a dumping-ground for any and all wares. In a much greater degree than ever before, the purchasing agent who knows what he wants, and why, is able to buy for his system the best quality of goods available for the money he can spend.

The greatest credit for this increased efficiency in the school-supply market is due to the movement for the standardization of instructional equipment. There is, however, much yet to be done in this field. Manufacturers have opportunity for further service in standardizing prices and in reducing to a reasonable range the offerings in a given line of goods. An improved follow-up service might, with the backing of the cost accountants and other experts, put before us certain facts concerning real values. Without assuming to lay down hard-and-fast rules in the matter, I do advocate the principle of standardization, provided limits are not too rigidly set.

Handicaps to Progress

Granting the evident improvement over the old days of hit-or-miss purchasing, the situation as the business manager faces it is still far from perfect. Aside from the natural difficulties which will persist while men are men and money is power, there are certain other definite handicaps which impede the way to progress. Chief among these are the restrictions or lack of power imposed upon the purchasing agent by state legislation or local ordinance. A common form of limitation may, for instance, oblige the buyer to award an order to the lowest bidder on the sole basis of the figure submitted. The public buyer who must today submit to a higher body the bids received, often finds that the greater part of his task is in convincing such a body that the low bidder is not necessarily the one from whom the goods should be purchased.

One of the greatest handicaps in the purchasing of schoolhouse equipment today is what might be

termed the "bargain counter purchaser." As John Ruskin once wrote, "There is scarcely anything in this world that some man cannot make a little worse and sell a little cheaper, and buyers who consider price only, are this man's lawful prey." Each party to a purchase contract must, if the best results are to be achieved, be convinced that other things than price count. Let the bidder know that the buyer is fully informed as to what he needs and why he needs it, that he knows the essentials of genuine worth, that he is willing to pay a fair price for fair value, and there is every evidence to prove that the bidder will do his utmost to serve the buyer to the best of his ability and with the best his house has to offer. Confident that his product is to be considered on the basis of merit, he meets the prospective purchaser in a spirit of confidence that is decidedly conducive to profitable dealing.

Another point of embarrassment frequently encountered by the school-supply purchaser is the obligation customarily imposed on him to throw bidding open to the general public with no other assurance of the standing of the bidder than the certified check, which is, more cases than not, the greatest farce reverted to in business. The certified check may signify nothing, sometimes not even the equivalent of a bank deposit. When public officials are required to throw the bidding open to the general public, they should be permitted to call for a certification bond, commonly known as a bid bond. If in any state, municipality, or other community, the public official is not bound by the restriction described above, there is little or no excuse for his not procuring for his institution first-class goods backed by reliable dealers or manufacturers.

Unwise and Unfair Competition

The wholesale throwing-open of the bidding gives rise to another problem. We who buy for any public department cannot to any great degree, without criticism, follow the general procedure in attracting competition upon the same basis as is in vogue in private corporations. We are not allowed, under the law, to solicit from a list of those that we know will sell us the produce that our business requires, or that which might be named, in another term, the best goods to fit our program. We therefore cannot maintain the confidence that we should in the source of all of our supplies, but can merely see that there is listed in the call for bids on a given product, the names of the concerns that we know as reliable and then trust to Providence that the selection of some one of them will be brought about. Sources of supply differ widely among themselves and should not in honesty be classified on an equal basis. The buyer should be conversant with these varied sources, their limitations and particular interests. I do not rate it an honest procedure to solicit prices and proposals from a random sampling of sources, without regard to the specific nature of the house.

I have in mind a particular instance in regard to the equipping of a junior high school with school desks in a certain city where, if only legitimate competition based upon the merits of the house were permitted, the picture would be considerably different; but in submitting bids and proposals on the equipment for this school, Mr. A., whose main business is framing pictures, selling antiques and post cards, will be allowed to bid; Mr. B., has a business confined entirely to office equipment; Mr. C. is a tramp salesman who will go into a store and purchase a teacher's desk for $29.50 and sell it to a customer for $30.00. I am told that this Mr. C. recently equipped a state normal school on this basis. Competition should certainly be restricted to reliable sources of supply.

Making Bidding More Simple

In any proposal looking to the improvement of the purchasing office, there must be included a suggestion that bids be offered in more simple form. Controversies in the awarding of large contracts are frequently rooted in this detail of form. Too technical in vocabulary, too detailed in treatment, too abstract in the description of goods, many bids are incomprehensible, or at best, time-wasting. A bid on general instructional supplies, for instance, need not specify the ingredients of chalk composition, or labor over technicalities that few, and very probably not the buyer, understand at all. The more simple and direct we make our call for bids, and the sooner we add the requirement that wherever possible, samples be submitted, the farther along the way we shall be. The buyer in compiling specifications has one arm of protection in the clause of restriction and the request that samples be submitted and, in certain commodities, that analysis be formulated in accordance with the specifications of the U. S. Bureau of Standards. The latter, especially, is applicable to such items as ink, paste, oils and fuel supplies. A year or two ago in calling for bids on a large contract for fuel, we had the experience of a low bidder on fuel-oil supply who condemned his own product by his own analysis, so much so that it was not necessary to send the specimen submitted to the laboratory for a test along with the other oil specimens.

The insertion of the restriction clause referred to above and by which "blank" reserves the right to reject any and all bids received should by all means be inserted in every proposal.

In Conclusion

In summing up the matter, then, I would offer the following words of advice around which the buyer may build his creed:

1. Know your goods.
2. Standardize.
3. Rate quality above price.
4. Earn and keep the confidence of the selling public.
5. Emphasize simplicity and good form in submitting bids.
6. Insist on the restriction clause and a bid bond.

Contemporary School Needs Affecting School Plant and Equipment

BY B. F. PITTENGER

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THE physical plant of a school—including site, buildings, and equipment—may, and in fact must, be regarded from two quite different viewpoints. This is true whether the purpose is to plan the layout and construction of a new plant or to measure the value of an old one. On the one hand must be considered the ability of the plant to accommodate the people and the program of the school, from the standpoint of the purposes which bring these people together and for which the school program exists. On the other hand, there are the more definitely structural matters, concerning foundations, walls, frame, materials, etc., which are likewise fundamental in importance. Roughly speaking, the first of these may be called the *educational aspect,* and the second the *architectural aspect,* of the school plant problem.

The Architectural Aspect

Architectural considerations for a long time outweighed educational considerations in the planning and construction of school buildings. "When our oldest buildings were constructed, education concerned itself with little besides learning out of books."[1] Under these circumstances, educational considerations were of minor importance. Moreover, the architects who first attacked the problems of schoolhouse planning were "general" architects, and were not aware of the then existing special requirements of schools. In recent years, while the schools have been expanding into highly specialized organizations making very complex demands upon their housing facilities and equipment, there has slowly emerged a group of school architects who are specializing more or less in this new field. But school buildings are still frequently planned by general architects, or by none at all; and the results may be seen in many recently constructed, expensive buildings whose usefulness for school purposes is not what it should be.

The Educational Aspect

Other modern buildings, on the contrary, give clear evidence that they have been planned to meet educational as well as architectural requirements. As one writer states:[2]

> "The outstanding essentials of modern school architecture may be said to consist in the proper coordination of the architectural requirements necessary to provide buildings best suited to the teaching of the school child of today in the courses and by the methods prescribed by modern education."

This is only another way of saying that, in contrast to the older procedure, educational factors should have the right-of-way over purely architectural ones. Style, plan, proportions, window arrangement, and all the other architectural features of a school building, should be determined from the standpoint of educational needs. Another writer[3] puts the idea in these words:

> "The adaptation of the building to the school organization is more important than any other problem connected with school buildings. . . . The first thing and the last thing that a school architect or a board of education should do in the planning and erecting of a school building is to seek the advice and counsel of those who are to conduct the school in that building after it is erected."

Educational versus Architectural Specifications

All who have ever been involved in the planning or construction of a new schoolhouse will have a very lively memory of "architectural specifications." They will recall a list of elaborated details covering, besides the general "plan," matters of construction and materials down to the minutest part. Not many of these persons, however, will have even so much as heard of "educational specifications." The various uses to be made of these educational specifications need not be insisted upon at this point. But it is important to note that, just as architectural specifications reflect in detail the architectural aspects of the school-building problem, so the educational aspects of that problem may be reflected in detailed specifications of a corresponding and equally necessary kind.

Schoolhouse Planning by General Architects

During the first half of the nineteenth century, public school buildings of elementary grade gave little or no evidence of skilled architectural planning. Just when the professional architect began to be consulted in these matters it would be difficult to say. The step was probably taken, in most instances, when a building that had grown to considerable dimensions by sheer accretion—by adding rooms now and then as increases in enrollment or diversifications required—had to be razed and a new, many-roomed building erected in its stead. Such a problem would prove too large for a board or community to handle without aid. Suggestions for the employment of ar-

[1] Bobbitt, F.; *Grand Rapids Survey*, p. 345.
[2] Gompert, W. H.; in the *American School Board Journal,* September, 1924, p. 51.
[3] Cox, E. M.; in Donovan's *School Architecture,* p. 85.

chitectural assistance may have come from already existing practices in the planning of other large public buildings, and of colleges and schools of secondary grade.

Whenever the practice began, and under whatever circumstances, it is clear that the early architects gave more consideration to stresses and strains, materials, and proportions and appearance than to the specialized requirements of the schools. It is difficult today to identify surely as schoolhouses most of the buildings erected for that purpose in the 1860's or '70's. Even in external appearance there was little to suggest a "school type." They were likely to resemble either the high-class residence architecture of the period or some of the many kinds of public buildings.

The residential form of school was tall, with a steeply slanting roof and slender chimneys. Its walls were heavy with brick or stone, with irregular angles and projections. Huge bays were common. The windows were tall and narrow, separated by wide expanses of blank wall space, and were scarcely more numerous than would be found in a private dwelling. The rooms were generally small and had very high ceilings. As time passed, more and more attention came to be paid to lighting problems, and the windows increased in size and numbers. But otherwise, this type continued with very little change until near the close of the century.

The institutional forms, which were modeled after the general pattern of other public buildings, were more varied in character, since there was no fixed type of public architecture. In general, however, they had one significant point in common; i.e., they seldom or never suggested a school.

The Rise of Specialized School Architecture

Somewhere around 1890 a new, indigenous type of public school architecture put in its appearance.[4] This took the form of the now widespread "packing-case" type, with straight, regular walls and a flat roof. Unilateral lighting was provided, with well-banked windows, and blank exterior walls where no windows were placed. The structures were of masonry throughout, and fire-resisting or fireproof. Auditoriums and other large general service rooms were given their proper place on the first floor. Offices, science rooms, and space for vocational instruction appeared. By this time, very clearly, the specialized needs of schools were making themselves felt, and were given attention in the planning to the frequent neglect of exterior appearance. Indeed, many of the early packing-box schoolhouses were about as ugly and unattractive as it was possible to make them. One of the major problems of contemporary school architecture is that of retaining the flexibility and adaptability of this widely adopted type and at the same time securing good proportions and an attractive, not to say beautiful, exterior.

Modern Period of Joint Planning by Architectural and Educational Specialists

By the beginning of the present century, then, architects were giving very definite consideration to the special requirements of schools. School buildings were being planned from the inside out, instead of from the outside in. That is to say, in many cases at least, first attention was given to the space needs of children and teachers, and external appearance was subordinated. The result was frequently a loss from the esthetic standpoint, but there was usually a decided gain in practical efficiency.

More recently, however, educators as well as architects have been attracted to the problem. One clear evidence of this is the growth of state control over the minimum requirements for school buildings, maintained by an increasing number of state departments of education. But perhaps the school survey movement, which has reached large proportions during the last two decades, has been mainly responsible for the new development. The deficiencies discovered in many local surveys were often found to center in the school plant; either in that the plant was already defective, or that it would not measure up to the requirements imposed by the reforms that were being recommended. The building and equipment portion has come to be a typical part of the standard school survey, and this movement has advanced school-plant requirements far beyond the vision of most school architects.

Since the school surveyors are usually men and women primarily interested in education, and not architects, the outcome of the movement has been a considerable body of educational literature centering around the school plant. This stimulus has produced specialists who are approaching school-plant problems from the standpoint of the educator; a type of specialization that has already been noted. We thus come back to the suggestion that the school-plant problem presents two large aspects—the architectural and the educational, that each is evolving into specialties, and that the current need is for closer collaboration between these two groups of specialists. And there is evidence that this collaboration is proceeding.

Dependence of Educational Specifications upon Modern School Needs and Organization

The progress that has been made in the present century has been principally along the line of fitting the building and its equipment more perfectly to the greatly changed and expanded needs of modern schools. There have been changes making for the greater safety of teachers and pupils, such as fireproof construction and the supplying of fire-protective apparatus. There have been changes making for better health, such as sanitary and medical services and equipment.

[4] An excellent pictorial series, depicting school-building progress in one American city from 1850 to 1910, is offered in the volume on "School Buildings and Equipment" in the *Cleveland School Survey*, pp. 21 to 36.

as well as better lighting, heating, and ventilation. There have been changes making for larger educational service, by providing quarters and facilities for a greatly enriched curriculum and for extra-curricular activities. Attention is being given to the proper placement in the general plan of these various space provisions, in order to secure the maximum economy of time and efficiency of use. As a result, we now find school buildings filled with special rooms for special purposes; classrooms planned and arranged, and furnishings placed and adjusted, with a view toward greatest usefulness; and constantly increasing thought for the beautiful in architecture and decoration, consistent with the maximum of use.

Consequent Difficulties

"School programs," writes Almack, "are immutable when written in structural materials of wood, stone, brick, concrete, or steel. The completion of a building program exhausts the resources of a community for the terms of the indebtedness."[5] And Professor Judd writes: "We are confronted with the great difficulty of trying to accommodate our building plans to school plans which are by no means completely worked out."[6]

These sentences contain the burden of the educator's difficulties in school-building planning. Will all of the school activities now regarded as essential continue to be so regarded throughout the lifetime of the building? What new activities are likely to arise, to displace or supplement those now existing? What changes in the housing or equipment of the probably permanent activities may be anticipated? Education is a changing and growing process; the school is a growing and changing institution. The problem is to outline a set of specifications which will adequately accommodate existing activities, and which will not impede the changes that are likely to occur. McCormack[7] puts the gist of the matter thus:

> "It is important for the architect who has to put up a school building to keep in mind the fact that the course of study is going to become more and more complex in the future. New subjects will be added, and in many cases these new subjects will require building accommodations somewhat different from those that are required for the ordinary class. It is consequently important that we keep in mind the general relationship between the building and the course of study, and that we provide so far as possible for future enlargement."

Contemporary School Needs Which Affect Plant and Equipment

A modern school requires from its physical plant and equipment the satisfaction of three distinct sets of needs. First, the regular school personnel, particularly the pupils and teachers, must be accommodated. There must be neither overcrowding nor unnecessary waste of space. Secondly, the program of school activities, both curricular and extra-curricular, must be accommodated. Space and equipment should be suitable in kind and sufficient in quantity for each general and specialized activity. In the third place, proper accommodations must be provided for such community services as the school proposes to undertake. No school plant can be satisfactory from the educational aspect which fails to measure up to all these requirements.

The first need must be stated in terms of the total number of persons to be accommodated. There must be sufficient floor space, playground space, and other space to provide enough sittings and other pupil stations for the entire enrollment; and sufficient office and related space to accommodate the teaching, supervisory and administrative staffs. Space must be provided for personnel workers, clerical workers, janitors, and all other people in the school. The first need of the school plant is to house persons; and the first demand to be put upon equipment is to meet the needs of the people who are to use it.

A school plant must house and equip activities as well as people; indeed, since the needs of the people are determined by their activities, the personnel requirements are merged with the program requirements. Provision must be made to accommodate the pupils and teachers working upon general classroom subjects, the sciences, the vocational subjects, and music and drawing, in sufficient quantity to handle the "peak load" in each. Auditorium, gymnasium, playground, and other supplementary activities must be cared for, and space provided for lunch rooms, medical services, etc. In elementary schools a proper complement of kindergarten and grade rooms must be provided. In every case the number of persons concerned in each activity must be considered, as well as the specialized physical needs.

Today, increasing demands are being made upon the school plant for community uses outside of school hours. One function of local government, it is held, is to provide facilities for organizing and directing the spare-time activities of citizens. For this service some physical equipment is necessary, and the school plant usually offers the most suitable existing accommodations. The principle of economy is also served by its use; on the one hand by avoiding unnecessary duplication of facilities, and on the other by providing use for an expensive plant at times when it would otherwise stand idle. To a considerable extent, a plant which serves school needs will also serve these community purposes, although some additions will often be necessary.

Features of Contemporary Organization Which Affect the School Plant and Equipment

School organization is related to school-plant problems mainly in that it determines the units of construction and equipment. The traditional system consisting of elementary schools of seven

[5] Almack, J. C.; *American School Board Journal*, June, 1923, p. 53.
[6] Judd, C. H.; *Proceedings* of the National Education Association, 1919, p. 367.
[7] McCormack, W. R.; *St. Louis Survey*, Part I, pp. 125-6.

or eight grades and a high school of four grades will call for different housing units from those for a system containing a five- or six-year elementary school and a junior and a senior high school of three grades each. The question of the joint or separate housing of these latter divisions will also affect the problem. Accommodations for an elementary school of the traditional graded sort will be different from those for one organized on the "platoon" or work-study-play plan. A school which groups its children according to ability as well as according to grade advancement will require, as a rule, adaptations in its room-lists and floor-plans. Special classes for backward or defective children, if provided, will call for special accommodations. There is also a new problem, just emerging over the educational horizon, of whether or not the organization shall contain a junior college. If so, space must be provided for its various departments and services, either in a separate building or in that which houses the senior high school. As far as possible, each of these organization matters should be decided before the building plans are drawn; and the difficulty of forecasting all future needs in these respects is evident.

Equipment Budgeting

Modern Educational Requirements Demand Adequate and Systematic Expenditures for Equipment and Supplies

BY HARRY S. GANDERS

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PRESENT methods of equipment management are far from satisfactory. Problems of equipment are allowed to come up only after board members, executives and committees have exhausted their enthusiasms, energies and patience upon the innumerable problems incident to the erection of the building itself. Moneys for equipment usually are not budgeted. Often there is nothing left in the building fund for equipment when the new structure is completed.

School authorities in many instances are too desirous of a monumental building to consider the necessity for the equipment that makes the building useful in an educational way. Contractors' original bids often do not cover the cost of alterations and improvements. From this latter cause alone, it frequently becomes impossible to place adequate equipment in fine buildings. The board, being faced with the prospect of having a beautiful new building stand idle because of inadequate funds for equipping it, pays for equipment out of maintenance funds. If by chance any moneys do remain from the reserves set aside for equipment, expenditures are unguided and uncontrolled because unbudgeted. The problem becomes one of "What can we do?" not, "What is the best investment in school equipment that can be made?"

As a result of insufficient funds, or the unbusinesslike procedure of making unbudgeted expenditures, educational and hygienic values are ignored in the selection of furniture and machinery. *Cost* becomes the *only* consideration in the purchase of equipment.

The Percentage Estimate

Where attempts are made to set aside funds for equipment, the method most commonly used is the "percentage of total building costs" or "lump-sum" estimate. Certain architects allow about 8 per cent of the building cost to cover equipment costs for an elementary school, and about 12 per cent in case of a high school. This is an easy method, but its simplicity over-recommends it.

In the first place, architects are not equipment engineers. They don't know equipment needs. Their interest is in a fine building and, in their opinion, building needs are primary. If insufficient funds remain for equipment, that is not primarily their concern.

In the second place, there is no uniformity among school buildings of various cities, nor equipment "set-ups," that would justify a flat percentage estimate's being applied everywhere. The percentage estimate is based on equipment of existing buildings, many of which are inadequately equipped from causes pointed out above. Furthermore, neither architects nor others have made a thoroughgoing study of what equipment should go into a "typical" elementary, junior high or senior high school. Such an investigation is needed.

Even if the same standard equipment were provided in standardized buildings, there is every reason to believe that differences in cost would not vary together from year to year.

Dr. Loomis,[1] in the report of his study of equipment estimating, showed the prevailing method of percentage estimating to be unreliable, inadequate and inflexible. He showed probable differences in the percentages for equipment of the total cost, where *only three of all the possible variables* were allowed to affect the percentages. In eight hypothetical cases percentages for equipment were as follows:

[1] Loomis, A. K.: *The Technique of Estimating School Equipment Costs.*—Bureau of Publications, Teachers College, New York. 1926.

Cases	Percentages of Total Cost of Building for Equipment
a. Where cost of equipment is kept constant and—	
1. *Minimum* building cost per cubic foot of 20¢ is assumed	12%
2. *Maximum* building cost per cubic foot of 40¢ is assumed	6%
b. Where cost of building is kept constant and—	
3. Maximum cost of equipment due to an assumed 50% increase in *quantity needed,* is assumed	12%
4. Minimum cost of equipment due to an assumed 25% decrease in price for *lower quality,* is assumed	6%
c. Where cost of building is assumed to vary to the extreme in one direction, and cost of equipment to the extreme in the other direction and—	
5. Minimum building costs and maximum equipment cost are assumed	18%
6. Maximum building cost and minimum equipment cost are assumed	4½%
d. Where both building and equipment costs vary to the extreme in the same direction and—	
7. Maximum building costs and maximum equipment costs are assumed	9%
8. Minimum building costs and minimum equipment costs are assumed	9%

Thus it will be seen that possible variations in costs may cause a difference in the percentage for equipment to vary from 4½ to 18 per cent. The difference between percentages might be even more if all variables, instead of just three, were taken into account.

Variations in costs are actually wider than in the assumed cases above; therefore, actual cases would show even a wider variation in percentages. Hence the "lump-sum" or "percentage" method of estimating is grossly unreliable.

In addition to its being unreliable, Loomis points out that the percentage basis is inadequate, because estimates are not in detail and consequently expenditures can not be guided and controlled by them. It is evident also that percentage estimates fail to make any allowance for the special needs of a particular school or differences in financial ability to buy equipment.

Advantages in Equipment Budgeting

A comprehensive, intelligent budgeting of the detailed items of school equipment is a necessity recognized by efficient and progressive school administrators. The benefits resulting from good business practices are as attainable in equipment management as in other fields. Equipment budgeting is foundational to determining the degree of completeness of equipment for each new school unit, the detailed selection of items, equipment purchasing and payment, and equipment accounting.

Budgeting of equipment will result in: (a) controlled expenditures, (b) directed expenditures, (c) sufficient funds available when obligations become due, (d) more time, and a better basis for giving consideration to hygienic and educational values in equipment selected and (e) better equipment at more favorable prices.

Equipment Budgeting Procedure

The steps leading up to equipment budgeting are: (a) the superintendent and designated members of his staff determine the location, size and type of the building; (b) the number and type of classrooms, cafeterias, shops and other units that must be included are determined; (c) the educational activities to be carried on in the various rooms are decided upon.

The budgeting of new equipment for the building should now be made and the estimated amount necessary for equipment as well as the necessary amounts for site, grading and landscaping should be deducted from the total bond issue, in order that the architect may know the total possible net cost of the building before he commences his work.

a. The first step in budget estimating is to list the number and types of all items of equipment for each room, that will be necessary for carrying out the proposed educational program of the school. Types or kinds of equipment items should be designated by numbers corresponding to item numbers in the *standard specifications.*

(If hundreds of industrial concerns can be induced to use standard "master" specifications in the manufacture, and "specification labels" in the sale, of their products, as was done by the Federal Specifications Board under Secretary Hoover, it would seem that the cooperative development of standard specifications for school equipment might be as feasible as it is desirable.)

b. There should then be a careful evaluation of items of equipment in buildings being replaced, if any. Such evaluations should be in terms of standard specifications. The number of items in old buildings that conform in major respects to the specifications should be entered as "reductions" from the original list in "*a*" above. If no standard specifications have been developed and none are available, the committee can merely exercise its judgment.

c. The superintendent should inform his committee of the action of the board determining which *quality level* specifications are to be used. Where specifications on-but-one-level have been developed, or where there are none, the superintendent informs the committee which one of Loomis'[2] 1925 lists is to be used.

d. The superintendent's committee, using the designated price list, submits and re-submits the recommended list of equipment until no further revisions are necessary. Following is the form of this report:

Quantity			Price List Item No.	Article	Specification No. or Description	Unit Price	Extension
To Equip	Deducted	To Buy					
1	2	3	4	5	6	7	8

e. If it is assumed that this equipment budget is being prepared in 1929, it becomes necessary to measure the change in price level from 1925 (the

[2] Loomis, A. K., "School Equipment Costs"; Strayer, G. D., and Engelhardt, N. L., School Administration Series, Bureau of Publications, Teachers College, Columbia University, New York. 1926.

CALCULATION OF THE FURNITURE INDEX NUMBER FOR THE "X" SCHOOL
(From Loomis)

Quantity Needed	Price List Item No.	Article	1925			1929 [a]
			Unit Price	Extension	Unit Price	Extension
1	2	3	4	5	6	7
200	301	Chairs, auditorium	$3.95	$790.00	$3.75	$750.00
16	318	Chairs, teachers'	14.45	231.20	15.00	240.00
15	402	Desks, teachers'	20.25	303.75	22.00	330.00
1	414	Desk, office	66.90	66.90	60.00	60.00
156	450	Desks, pupils' sizes 1 and 2	6.45	1,006.20	6.75	1,053.00
132	451	Desks, pupils' sizes 3 and 4	6.18	815.76	6.50	858.00
111	452	Desks, pupils' sizes 5 and 6	5.95	660.45	6.25	693.75
1	597	Piano, upright	300.00	300.00	300.00	300.00
42	775	Table, drawing	11.15	468.30	12.50	525.00
2	806	Tables, kindergarten	13.50	27.00	14.00	28.00
11	808	Tables, kindergarten	11.55	127.05	12.50	137.50
5	810	Tables, sand	23.25	116.25	25.00	125.00
6	818	Tables, library	40.00	240.00	40.00	240.00
6	820	Tables, library	45.00	270.00	45.00	270.00
		Totals		$5,422.86		5,610.25

[a] The 1929 units prices are merely hypothetical.

$\frac{5,610.25}{5,422.86} = 1.03$ The index number is 1.03.

The same calculation must be made for machinery.

year for which the Loomis price lists were prepared) to 1929. The 1925 prices and prices for 1929 must be paralleled and calculations made as illustrated in the accompanying table. The 1929 quotations, or those for any current year, can be obtained, by request, from the Division of Field Studies of the Institute of Educational Research, Teachers College, Columbia University.

f. The report prepared according to "*d*" above gives prices at the 1925 level. The table gives the index number, in this case 1.03. In order to change the total cost as estimated for 1925 in "*d*" to the cost for 1929, the current year, multiply the 1925 cost by the index number 1.03. The product is the estimated price of equipment for the new school at 1929 prices.

g. The total in "*f*" above does not include costs for freight, therefore the average distance of supply houses which furnish major items of equipment should be calculated, shipping weights and freight rates ascertained, and an estimate of freight charges made. This should be added to the total estimate in "*f*."

h. The total in "*g*" does not include cost of installation. Current local labor prices must be learned, total time estimated and these costs added to the total in "*g*." This is the final estimated cost of the equipment for the new building.

It is safe to predict that within a few months, the calculations in "*e*" will no longer need to be made locally. The current publication month by month of an index of school equipment prices is as necessary as other index numbers of costs in education now being published in monthly periodicals.[3]

[3] *The Teachers' College Record*, New York City, publishes each month an "Index of the Cost of Living for Teachers," an "Index of the Price of School Buildings," an "Index of the Price of School Bonds," and an "Index of the Price of Instructional Supplies," all prepared by Prof. Harold F. Clark.

For a discussion of another phase of the subject of the foregoing article, see "Equipment Apparatus That Lends Itself to Modern Progressive Ideas in Education," pages 275 to 279 of this volume.

Section II

DESIGN AND CONSTRUCTION OF BUILDINGS

The Part Which the State Should Play in Schoolhouse Planning

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I PRESUME there is little need to discuss the desirability of state divisions of school planning. Now that about one-third of our states have these divisions, we may assume they have been born of necessity. The causes that brought them into being, however, will bear careful analysis, for in them we should find fundamental indices to the character and scope of their activities.

There have been three more or less basic ideas behind the agitations for state school-planning departments. The first is a recognition of the helplessness of the usual educator when faced with a building campaign. Most educators are actively occupied during the school day. Their vacations synchronize with those of other educators. Their contacts with new buildings, new organizational schemes, or clever details of structure or arrangement, are limited to experiences in a relatively small local environment and what they may glean from published articles. Their board or their architect can request a solution to an endless number of pertinent educational planning problems to which they have no answer. This is not due to incompetency or ignorance, but rather to our rightful emphasis on the essentials of administration and teaching. Neither, as yet, has become static, and housing must shape itself as an interpretation of education in its various aspects. This demands research, and may deal with the best methods of organization in certain districts, or studies in financial ability, as well as the actual planning of schools.

The inability of education to diagnose itself for architecture, has led to a gradual lack of faith in architects. This is a second reason behind the urge for planning divisions, although the inference is not entirely just to architecture. However, at times architecture has been traditional and empirical. Often it has, of necessity, had to satisfy those in political authority rather than those in educational service. When it could not build for educational usefulness, it has tried at least to satisfy a local taste for the monumental in architecture.

This brings us to the third argument for school-planning bureaus. They will save money. The literature dealing with the legislative history of school-planning bills is rife with economy arguments. Many of the acts make it the duty of the department to "establish standards" and "check plans for waste." This is a most laudable endeavor, provided the state standardizes in a very fundamental way only. Education is a continual changing progress upward, and architecture should be free to companion with it, and grow and interpret in an unrestrained manner.

These, then, are the arguments for state school-planning divisions as popularly stated. We need educational study and appraisal that we may clearly evaluate our building problems. Architecture cannot be trusted to interpret for us. School buildings must be practical in cost, as well as beautiful. These are rather crude statements, and perhaps we may evaluate them more clearly if we consider them from the standpoint of the human relationships involved.

Four groups are vitally interested in school-planning problems. There is, first, the public, who have the children and pay the bills. Then there is the educator, backed up with his school-planning division. The problem, as these people see it, is presented to the architect, and he in turn, must satisfy them, and those forces of government having jurisdiction over his work. The forces of government—boards of supervisors, city councils, school boards, city-planning commissions, and the like—are the weakest group involved. This is the great shame of our American university. Each has its imposing department of political science. But when it comes to furnishing government leadership, most departments are little better than harmless seminars. The old-type politicians still have the field to themselves. As a result we have no profession of politics, and almost no helpful leadership to which we can turn in this field. Let us consider each of these groups in relation to a state school-planning service.

The Public and the State School-Planning Service

We are a democracy, and we function with the clumsy wastefulness typical of that form of government. We make progress only as we educate our constituency. Too much of the time the technicalities and tedium of the working day demand attention, to the exclusion of larger problems of education. State officers make many contacts, and get a broad and diversified view of education. They ought to be going from one district to another making surveys, studying specific problems, and holding needed conferences. In each case they ought to be able to leave behind specific suggestions for improvement. This is easily possible because state officers are accepted in most districts with authority. The local educator may know what ought to be done, but too often he is "a prophet without honor," and, in addition, the victim of local politics or too many good friends with a school site to sell.

Without a survey service, planning divisions become largely "yes men" to the amateur ideas of each locality. Under these conditions the district requests "the plans of a two-room school," and the planning division reaches into a stock cubbyhole and mails out several plans, any one of which the district may select and use. In many cases the site is not seen, the amount of the bond issue unquestioned, the possibilities of unionization unstudied, and the type of building undisputed. This is not state service. We might, I think, call it state debasement.

Progress is not easy to encompass. Its achievement is aided, however, when a necessity to change or a public willingness for progress is at hand. School boards seldom request a survey without both factors being present in whole or in part. It is the business of a planning bureau to take this natural community interest, and develop it into a finer, educational conception. There is a lot of fundamental good in the people of any ordinary community. They have a maternal love for their children and they are predisposed to listen to ideas about education. I have never addressed a community meeting in which the audience has not been attentive and eagerly receptive.

State planning bureaus, then, owe educational leadership to the various communities they may be called on to serve. Space does not permit us to describe the character of this service in detail, but we can indicate, in outline form, some of the types of service in common practice:

A study of the best form of school organization for the community—
- A central union school, or several centers
- The jurisdiction of the board or boards
- The size of the administrative staff

A study of the cost of such a system—
- The cost of a building and site
- Operative costs due to the organizational change
- The district's ability to pay
- What other districts of like wealth afford

A study of the legal steps necessary to consummate the proposed program—
- The petitions to be circulated
- Community meetings
- The legal steps to elections

A study of the political organization necessary to achieve the new ideal—
- How to successfully circulate petitions
- The answer to the usual "anti" arguments
- The conduct of public meetings
- The use of printed matter
- Election day organization

A study of the meaning of education in a progressive community—
- The school as a cultural agency
- The need for an education that affects the child's every-day life
- Standards of health and sanitation
- The school and its esthetic values
- Citizenship and the school
- Efficient education and its patriotic significance

When state divisions do not render this type of service, schools are misplaced, public education remains dormant, money is misspent, district children are subjected to an inferior type of education, and educational progress is delayed indeterminately.

The School-Planning Division and the Educator

All that we have discussed or shall discuss is of vital significance to the educator. The school itself, however, is his chief concern, as the other aspects of school planning are a means, only, to this end.

How shall the division go about aiding him? Shall it draw him plans? Or publish a manual of standards to which all architects must adhere? Or shall it attempt to bring itself into full sympathy with modern education, and with this insight, attempt to gather for distribution, useful school-planning ideas? We have already noted the relation of architecture and government to school planning. Each is a separate sphere for professional development. No one individual can be technically effective in all three fields. For this reason education can not afford to usurp their scope of endeavor. To do so would be educational suicide. Conversely, we must develop our own needs, with illustrative solutions. We are forced to ask these related professions to develop with us. We cannot have ideal schools in a morally cankerous community. Neither can we expect architecture to develop perfection, unless we can state our problem clearly and technically for professional consideration. That, at least, is our first responsibility, and the almost total absence of published material in this field attests to the drastic need for research and organization in it.

For brevity, let us try to list the various aspects of such a school-planning service:

A. First, the division should have a basic understanding and appreciation of education and the curricula, as regards:
- (a) Curricula content and aims
- (b) Teaching methods
- (c) Child psychology
- (d) Child physiology
- (e) The educational meaning of each type of school

This fundamental knowledge should be interpreted into building principles, dealing with:

B. The School Sites:

1. Site Location
- (a) The relation of sites to city and regional planning, and the local and state laws in this field
- (b) The manner in which cities and districts grow
- (c) The effect of density and growth on school sites
- (d) Attendance area standards
- (e) The effect of topography, and geographical barriers on sites

(f) The moral environment of school sites and methods of safeguarding it

II. Site Specifications

(a) The size, frontage and shape of sites
(b) Frontage and orientation
(c) Contour and developmental costs
(d) Soil analysis and its relation to structural costs
(e) Play areas for various type schools, their drainage, surfacing and apparatus
(f) Garden developments, parking, roads, walks, etc.

C. The Gross Building:

I. The Factors of Layout

(a) The fundamentals of:
Arrangement
Departmental relationships
Future growth
(b) Form as it affects function and cost
(c) The proportionate spaces that may be legitimately devoted to various functions
(d) Orientation and
Light
Natural ventilation
Storm winds

II. General Standards of Construction

(a) The various types (A, B, C, D and E) and their costs
(b) The indices to building ability
(c) The educational value of each type of structure for each type of school—
(1) Type and local building products
(2) Climate as it affects type
(d) Standards of gross construction—
(1) Foundations
(2) Walls—outside, inside bearing, non-bearing, filler walls, etc.
(3) Etc.
(e) Cost, and wearing values of gross materials
(1) Upkeep costs
(2) Insurance rates

III. Main Standards of Pupil Hygiene and Safety

(a) The structural safety of materials
(b) The fireproofness of materials
(c) The educational usefulness of materials
(1) Insulation
(2) Acoustics
(3) Floor coverings
(4) The sanitation of materials
(d) Standards of safe circulation—
(1) Stairs
(2) Corridors
(3) Exits
(4) Etc.
(e) Standards of light, heat, and ventilation

IV. Minor Building Standards, such as:

(a) Minor safety details—handrails, stair treads, door checks, exit signs, etc.
(b) Hygiene, such as washability of wainscots, toilet floors, waste receptacles, incinerators, screens, sanitary chalk troughs, vents, etc.
(c) Wear on corridor floors, exterior metal work, exterior wall waterproofing, wainscots, hardware, door construction, etc.
(d) Minor details affecting health, as posture and seating, gym spring floors, etc.
(e) Interior trim standards—base, casings, doors, sash, jambs, sash operators, coves, picture molds, etc.

D. The School and Administration:

I. Gross Arrangements

(a) The building and its approaches
(b) The building as it relates to:
Garden areas
Play areas
(c) The location of toilets
(d) The interrelations of departments
(e) The administrative layout and its relation to whole building
(f) Teachers' offices
(g) Etc.

II. Minor Arrangements and Details

(a) Playground apparatus
(b) Toilet arrangement for supervision
(c) The classroom and supervision
(d) The general office layout
Public space
Executives' offices
Clerks' spaces
Storage
Health
Etc.
(e) Pupils' storage
Cloakrooms
Lockers
Bicycle racks, etc.

E. Diagnostic studies of various rooms, such as:

(a) Assembly
(b) Library
(c) Shops
(d) Science
(e) Art
(f) Music
(g) Domestic Art
(h) Etc.

F. Studies of special furniture and equipment, for the above and other rooms

G. The development of all state schools should be under the state division of school planning. These are likely to include:

Normal schools
Teachers colleges
Technical schools
Schools for the deaf
Schools for the blind
Rehabilitation, etc.

This brief outline, which does not begin to touch the field, is at least indicative of the scope of the work needing study. Planning bureaus operating on this basis are research and collecting agencies. The reader may wonder where all this material is to come from. In my own experience, I have procured it from the following sources:

(a) State school plans
(b) Plans submitted to our office by architects
(c) Details in schools visited
(d) Ideas of educators in the field
(e) Published data
(f) Published illustrations
(g) Sweet's catalogue, The American School and University, salesmen, manufacturers, etc.
(h) Ideas developed in our own office

There are educators, architects, manufacturers, and laymen all over our country who are continually faced with school-building problems. A school-planning department should bring these ideas together and make them available for other schools that need them. A draughting department should develop them on standardized material, and each detail, with a full statement of its educational significance, should be filed away for immediate use at any time. There must be a variety of solutions, because there is a variety of schools, communities, and personalities administering them, in any one state. In addition there are such factors as climate, available materials, site contour, etc., that further affect solutions. In the maze of filing drawers in our office we can produce a wealth of illustrative material on any one subject. I open the drawer marked High School Chemistry Laboratories, and find we have collected seven schemes for housing chemistry, each good under certain conditions; each suggestive to an architect planning a new school. I find we have an outline three pages long dealing with the "major aspects of junior college sites." Under gym lockers I find a variety of schemes, each evaluated by its descriptive sheet. This material is of immediate use to architects and educators planning schools, and by it some small district school may well benefit from the experiences of thousands of other people.

The Architect and the School-Planning Division

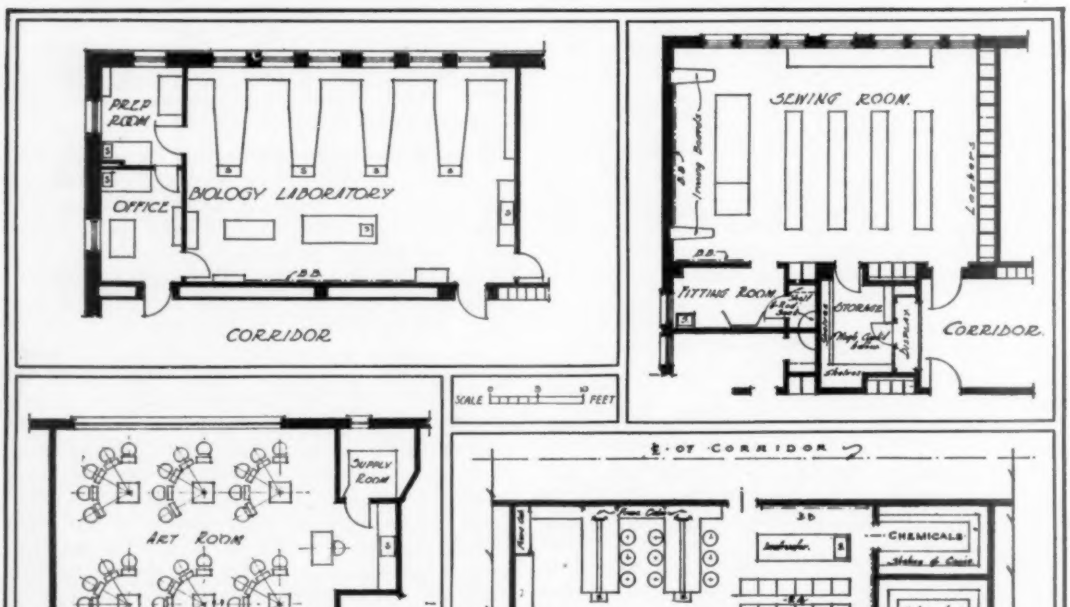
Perhaps the reader may question the willingness of architects to have their ideas stolen and their

planning prerogatives regulated. This, however, has not been a problem in our state. There are several reasons for it:

1. The Division of School Planning does not draw plans, or compete in any manner with architects.
2. We have insisted that boards employ achitects; that they pay adequate fees; that architects draw complete plans, have complete charge of supervision, and accept full responsibility for the results.
3. This has stopped price-cutting, protected legitimate architects, cut down competition, and put the work on a quality basis.
4. Our architects are agreed that every contact between a layman and an architect advertises architecture. When the contact is not satisfactory, architecture in general suffers. The service of a legitimate school-planning bureau is of definite and demonstrable value to architecture.
5. Architects succeed by the cleverness of their design, engineering skill, business ability and leadership, as well as by technical school-planning data. A successful architect knows how to best adapt technical data for maximum results.
6. The Division has been able, time after time, to protect architects from unreasonable requests and from political manipulation.
7. The problem of school housing is thus explained for architecture, but each architect is left free to develop ideas and arrangements of his own. The basic standards required are acceptable checks, and do not interfere with planning to the extent that political manipulation, ignorance, unreasonableness, etc., formerly did.

Leaving architecture to the architects has its difficulties. There are schools too far away to pay architects to go after them, and some few schools actually too poor to afford architects' fees. These may be handled through branches of the American Institute of Architects or through local architectural associations. These agencies will assign work to some one of their members, so the Division of School Planning is relieved of the need to become paternal in any sense, and some of the more prominent architects have actually furnished a free plan when conditions absolutely dictated. In this manner, architecture has served the entire needs of education in our state.

The results of this arrangement have been most gratifying. The breach between education and architecture has been ameliorated. Each has



FOUR ROOM LAYOUTS OF TYPICAL SCHOOL-PLANNING STUDIES

The biology laboratory was designed for junior college use. The tapered tables preserve good light for all. The office-laboratory and the preparation room have proved useful.

The sewing room has drawer type lockers that pull out of wall receptacles and fit into the table. The right-hand light is by request. Pupils (24) face one way only. There is a cutting table and a teacher's desk in front, and a blackboard with a bulletin board along the side and rear over the lockers.

The art room was designed for an advanced high school class. The seats cluster about six model-stands. These may be moved front to constitute a posing-platform.

The combination physics and chemistry laboratory was designed to meet the needs of a small rural high school. It contains its own lecture space. Since physics and chemistry are never offered at the same time in this school, the room has been successful. The tablet arm-chairs make the room available for other classes.

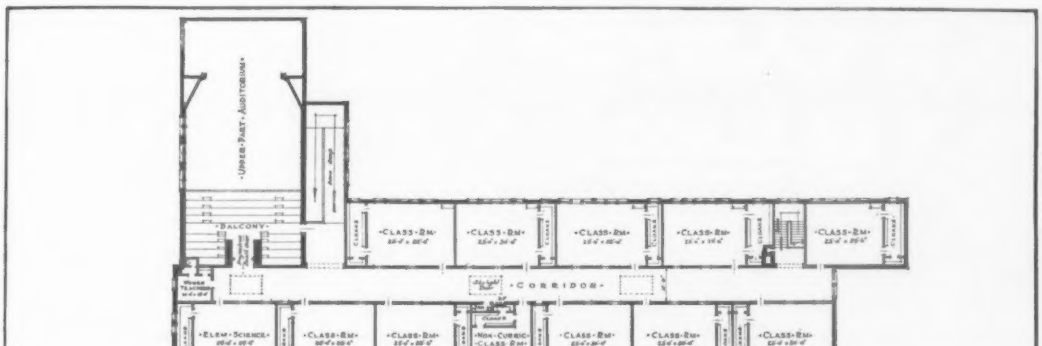
preserved its dignity and augmented its professional usefulness.

School Planning and Governmental Contacts

No city can be better than its government. If the powers that be allow a development haphazard and unrestricted, land values will be unstabilized, real estate sharks abundant, cheap, flimsy construction prevalent, political frauds commonplace, and even the lowly home owner will purchase with fallacious hopes. Schools cannot be properly planned under these conditions. Since there is no city plan, no zoning ordinance, no adequate building code, and no stabilization of main traffic ways, schools cannot be permanently placed in relation to residential populations, traffic ways, manufacturing districts, etc. For these basic reasons, school-planning divisions must be interested in, and seek cooperation from, various governmental agencies.

Under the city manager system, and from popular pressure, we are beginning, in some of our cities, to separate factual needs from politics, and it is in this atmosphere that we may hope for constructive progress. When city or regional planners are employed, a professional contact for the educational planner is available. The size of sites for various types of schools, their relation to business, industrial, apartment, and residential zones, the probable effect of growth on the site, population density and attendance areas, desirable site boundaries, etc., can now receive careful attention.

To the city councils and their employees we must look for cooperation, in building code regulation. When there is no cooperation, building codes often require the ludicrous of schools, and cost the local taxpayer thousands of dollars in wasted money. The writer has had battles with ordinances that allowed all temporary buildings to exist for one year only, and then required

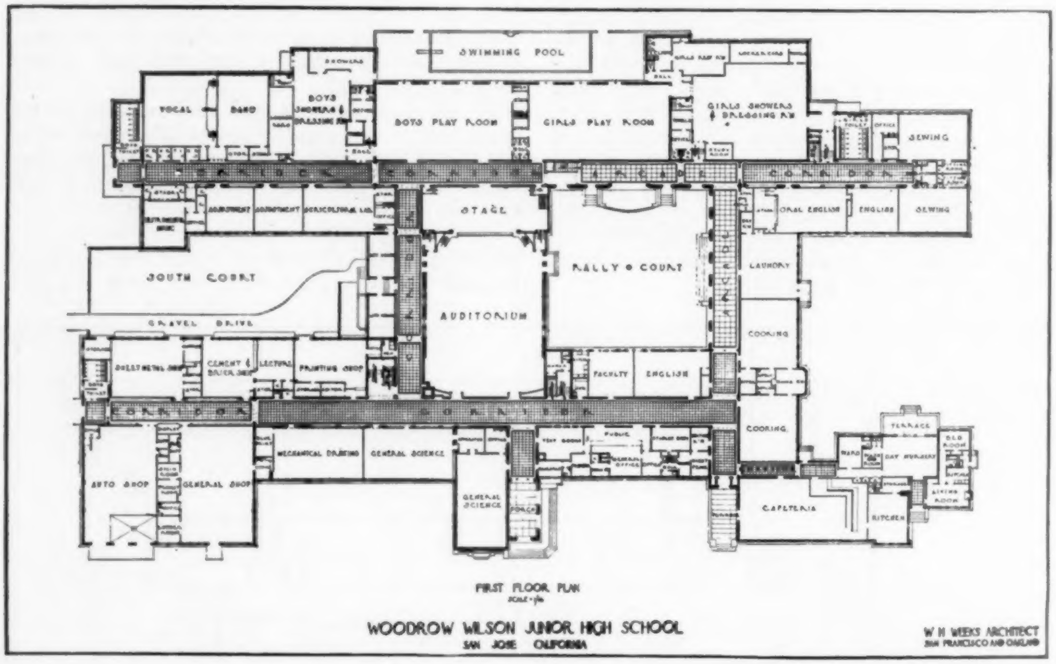


PLAN OF THE FIRST FLOOR OF AN ELEMENTARY SCHOOL

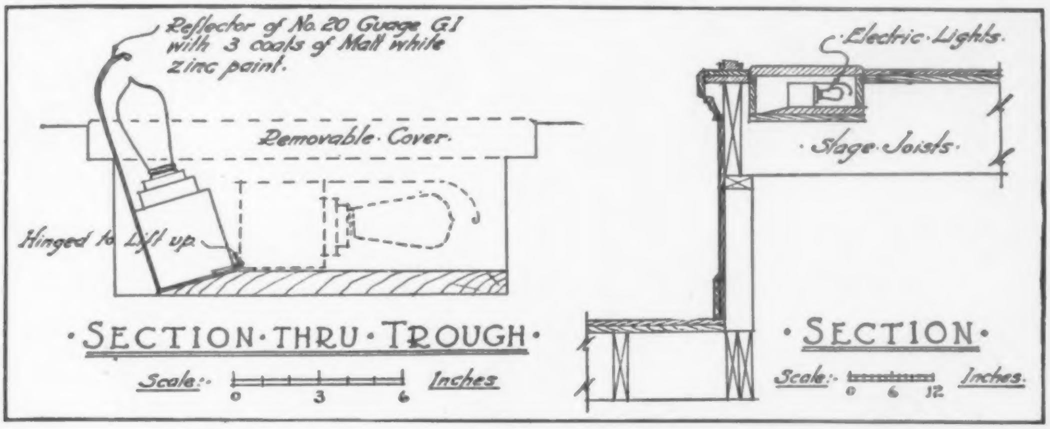
The building faces northeast. Extension is planned through the pantry on the left. The development of the functions expressed is indicative of school-planning service.

their destruction. This prohibited any use of portables. "Any public meeting-place, with a platform or stage, seating 300 people or more, shall be deemed a theater and meet the requirements thereof," says another code. Since all theaters by that code must have slanted floors, fixed seats, and be of "Class B" construction, with steel trusses and fireproof roof construction, no elementary school in town has an assembly, since the cost is too great, and level floors with movable seats are desired. Another code makes a "theater" of every assembly hall, and insists that it "connect to the street and escape ways only." An assembly attached to a school building is impossible in this town.

There are numerous instances about, where city



FOR COMPACTNESS, COMPLETENESS AND JUXTAPOSITION OF ROOMS, THESE PLANS ARE WORTHY OF STUDY



DISAPPEARING FOOTLIGHT TROUGH IN AUDITORIUM OF HIGH SCHOOL

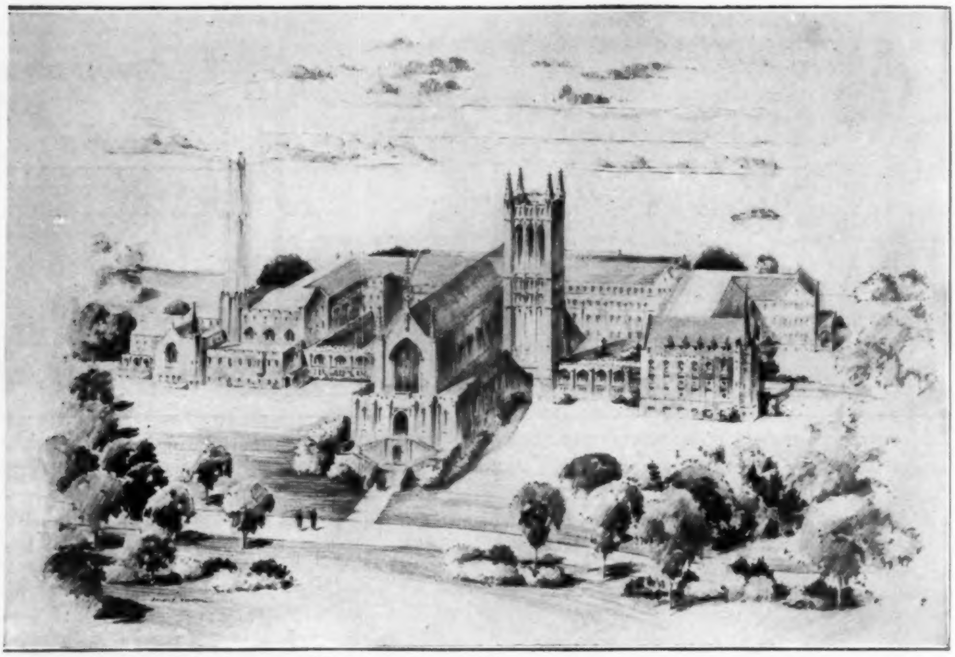
Typical of the details collected by the California State Division of Schoolhouse Planning for disbursal to architects

councils have refused to close streets crossing school sites, and some cases where they have tried to put streets through school yards. It is not uncommon for county boards of supervisors to refuse to improve roads over which school busses must travel. These conditions can be improved by education only, and they must of necessity be one of the responsibilities of a school-planning department. They are largely responsible for the recent agitations for state school codes.

The Organization of the State School-Planning Department

We have discussed briefly the various phases of state school-planning activities. A discussion of the organization of such a department may serve to sum up and clarify its activities. The division belongs under the Department of Education. It would presumably head up with a chief, who should be in close contact with the chiefs of the various divisions within his department. Below the chief, it should divide into a survey department, a plan-checking department, clerical and stenographic help, and a draughting department. The law should make contracts on school buildings or site purchases void without the division's approval. The division, on the other hand, should stress service as its primary aim. There should be research into state school conditions in order that data be available for intelligent planning. There should be surveys in the field, that local districts may evaluate their educational needs. There should be a prompt, plan-checking service maintained, and this should consist of a check for fundamental layout, and a second check at a later date, of finished plans and specifications, for final approval. Lastly, the draughting room should continue with its increasing collection of school standards, and its chart, graph, and map service, in connection with survey work. In this way, those agencies responsible for school planning in its various phases may cooperate together toward real housing ideals.

For a summary of the Participation of State Departments of Education and Other State Agencies in Planning and Supervising Local School-Building Development, see Section XIII.



E. S. Brielmaier & Sons Company, Milwaukee, Wis., Architects

PLATE 1. ARCHITECT'S DRAWING OF FACULTY AND LIBRARY BUILDINGS, ST. BENEDICT'S COLLEGE, ATCHISON, KANS.

Combining the Medieval with Modern Architecture in College Buildings

BY SYLVESTER B. SCHMITZ, PH.D.

PROFESSOR OF EDUCATION AND DEAN, ST. BENEDICT'S COLLEGE, ATCHISON, KANS.

JOHN IRWIN BRIGHT, writing in the first edition of THE AMERICAN SCHOOL AND UNIVERSITY, appropriately states: "The characteristics of a civilization, in a very large degree, are evidenced by its buildings, for throughout the ages man has employed architecture as a tool with which to trace the record of his cultural progress."

This statement finds its most striking verification in European architecture dating back several hundred years, when people lavished their artistic fervor on cathedrals, churches, and monastic schools, many of which even to this day are objects of admiration and study for students of architecture the world over—monuments of the golden age of architecture. They are monuments of art because their creators have embodied in them the ideals, the aspirations and the culture dominant at the period of their construction. As century after century rolled by, changes and modifications were introduced, while retaining the general characteristics of the period that preceded. Many, if not all, of these changes and modifications, so characteristic of the different periods in the growth and development of architecture, lose their significance unless they are studied in the light of their symbolism. To the ordinary observer, this symbolism is a closed book, since correct interpretation of these changes and modifications presupposes a thorough acquaintance with the religious history of the times.

To trace these changes and modifications down through the centuries and, especially, to disclose their symbolic meaning, is not an easy task. This is so, partly because these monuments are scattered over Europe, and partly because many of the monuments representing intervening stages or phases of development have not withstood the ravages of times—ravages of the elements no less than those of vandal hands; hence, at the present time they are either partial or complete ruins. These as well as other factors render it imperative for the student of architecture to study out piecemeal the characteristic changes of the different periods, using for the purpose such remnants as have been preserved.

Such being the case, would it not be a distinct contribution to modern architecture, for some architect, thoroughly conversant with the growth

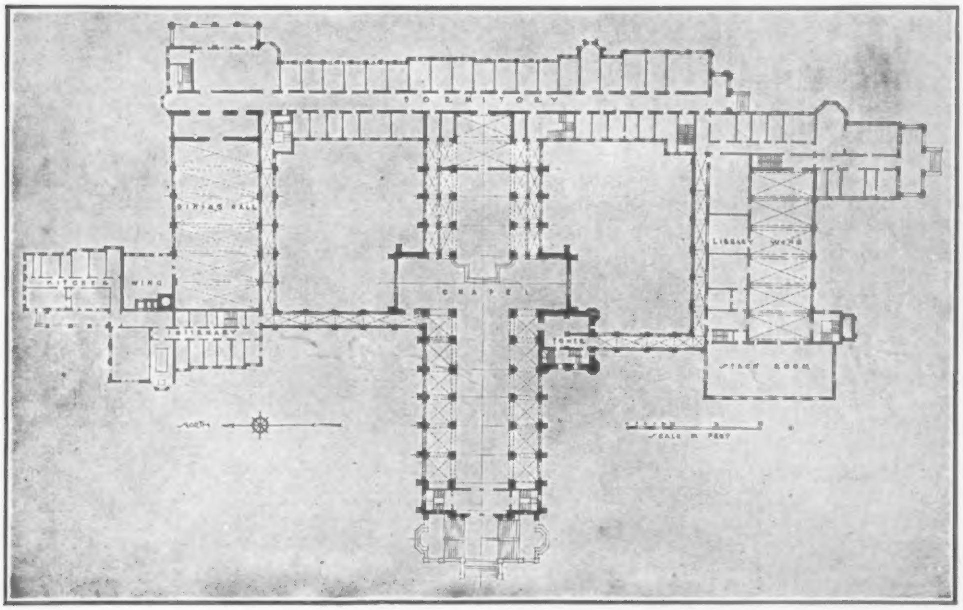


PLATE 2. GROUND PLAN OF THE SAME GROUP

and development of medieval architecture no less than with the best features of modern methods, to plan a group of buildings to embody the chief characteristics of the different periods, retaining as much as possible their original symbolic significance, and at the same time, include in the construction the best that modern architecture has to offer?

The Group Described

Such a group of buildings is being constructed at the present time at St. Benedict's College, Atchison, Kans., the architects being E. Brielmaier & Sons Company, Milwaukee, Wis. The purpose of this article is to attempt a description of this group, to provide illustrations and especially to

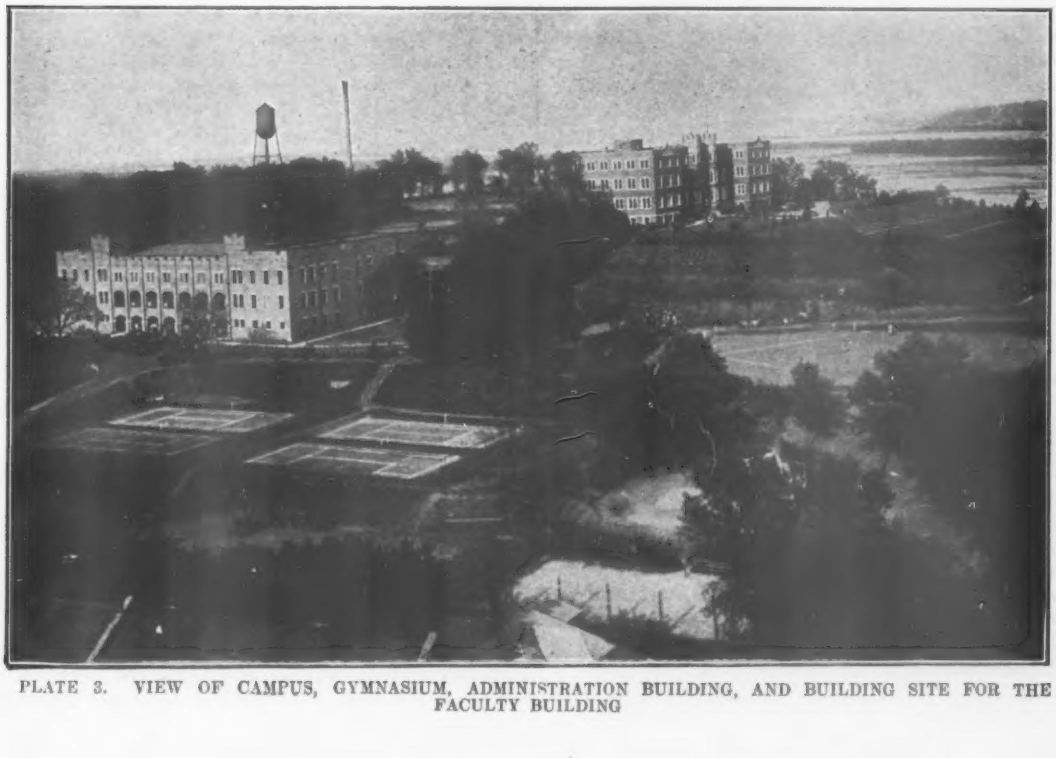


PLATE 3. VIEW OF CAMPUS, GYMNASIUM, ADMINISTRATION BUILDING, AND BUILDING SITE FOR THE FACULTY BUILDING

show some of the outstanding symbolic meanings embodied. The general plan adopted in this article is to place before the reader, first, general views with a general description of such views, and, second, to give specific views together with a description of their symbolism, wherever such symbolism is embodied.

The first view is the architect's drawing of the group of buildings around which this article is chiefly centered. The second view gives the ground plan of the same group.

This group of buildings is to serve as the Professional School of Theology, and as the residence quarters for the members of the college faculty. The reader should bear in mind that the professors of the college are professed members of the Benedictine community, and that they live a community life. Like monks of old, they live under the same roof and devote their lives to study, teaching and missionary work. The building in general is divided into three wings. The first, and one of the most essential, in such a group is the library building, situated on the right or south wing. The second wing is the living-quarters for the professors, teachers in training, theological students and lay brothers. The third wing is the dining and cooking department in which are located the infirmary quarters and quarters for the kitchen attendants, and the central power-plant that serves all the college buildings.

With the exception of the wing for the kitchen, the entire group is constructed of stone, both facing and walls. This also applies to all interior walls. Masonry construction was employed for several reasons: first, a desire to use local materials; second, the realization that stone would be without doubt the most permanent material of which the building could be built (this idea will be further discussed under the special features, where the idea of stability and permanency is treated); and, third, the adaptability of the stone to the period of architecture which was employed, namely, modified Tudor Gothic. The construction is fireproof throughout.

The library wing was placed on the south side of the group so that it would be equally accessible to professors and students, the students' living-quarters being to the south and west of the group. The main reading-room in the library wing receives most of its light from the south. On the north of the reading-room are two stories used for executive offices and private reading-rooms for the faculty members. The packing- and unpacking-room, binding-room and receiving-room are located on the ground floor under the reading-room. Above the reading-room are located special classrooms, club-room, art gallery and museum, which can be entered either by an automatic lift, stairway or stack stairway. This stackroom has a capacity of about 200,000 volumes, with special rooms off the main stackroom for the safekeeping of very valuable books and manuscripts. The library wing can be entered from the students' entrance on the south, or directly from the corridors in the dormitory building by the faculty members.

The chapel, occupying a central position in the group and facing west, is accessible from the library, dormitory and dining-room wings. Entrance from the north and south wings, that is, the dining-room and library wings, is effected by means of passageways which completely enclose two inner courts. The tower, 165 feet high, occupying a central position in the group near the chapel, is balanced on the north by an ornamental tower (stack) and by two spires, one on the north wing, and the other on the south wing.

The dormitory wing was designed with two things in mind. First, the prevailing winds coming from the east made it necessary that all sleeping-rooms be faced in this direction, and with very few exceptions all sleeping-rooms face the Missouri River. Toilets, baths, showers, linen-rooms, and other units are on the west side of the building. Second, in order that the excessive heat of the locality might be kept out of the building, and also for architectural reasons to be mentioned later in this article, the walls are built of solid stone, 3 feet thick down to 2 feet, furred on the inside with hollow tile for plastering.

The dining and kitchen wing is connected directly to the dormitory wing and by passageways to the library and chapel. The dining-room has a lofty ceiling, and has light from the north, south and west, and the interior is treated in the traditional manner of the old mansions of England—high wainscoting of wood. The serving-room, kitchen, and quarters for the attendants extend to the north, and are most modern and commodious. Ample provision has been made for storage of food and supplies. In the basement of the kitchen wing, provision has been made for the storage of bulky supplies. The space below the dining-room is used for the central heating-plant. Ample provision has been made as to stack capacity and other equipment so that additional boilers can be added to meet the requirements. The entrance to the boiler-room is at grade level so that all supplies and materials can be hauled directly into the boiler-room on large trucks. The infirmary is behind the dining-room wing and in connection with the kitchen serving-room, so that it is easy of access, both from the dormitory wing and the kitchen wing.

The Materials Employed

The type of construction employed throughout the building is wall bearing both for interior partitions and for exterior partitions, stone being used for all walls, the exterior being faced with coursed ashlar and the inside walls plastered. All floor slabs are of reinforced concrete. The sleeping-rooms have wood floors, and the corridors and toilets marble floors. The roofs are all of steel and tile, flat decks of copper, sloping roofs of slate. All sheet metal work, including gutters, conductors and flashing, are of copper. All windows throughout the building are out-swinging

steel casements; all interior door frames are steel; doors, with the exception of exit doors, are wood. Local stone, which resembles granite—a cross between marble and granite—and is known as "Waverly Ledge," is used for the facing of the buildings, and Carthage stone is used for the sills, copings, and in all other cut-stone work such as the tracery windows in the dining-room and chapel.

As to mechanical equipment, hot-water heating provided with forced circulation has been used throughout. The plumbing is of the very best of porcelain, and all piping is arranged for accessibility. The transformers for the light and power are located in the boiler-room, and a system of feeders to the various units of the building are provided so as to give balanced distribution. The aim throughout the building was to reduce maintenance to the minimum and assure perfect comfort in all seasons, and present a building, which, architecturally, would be pleasing.

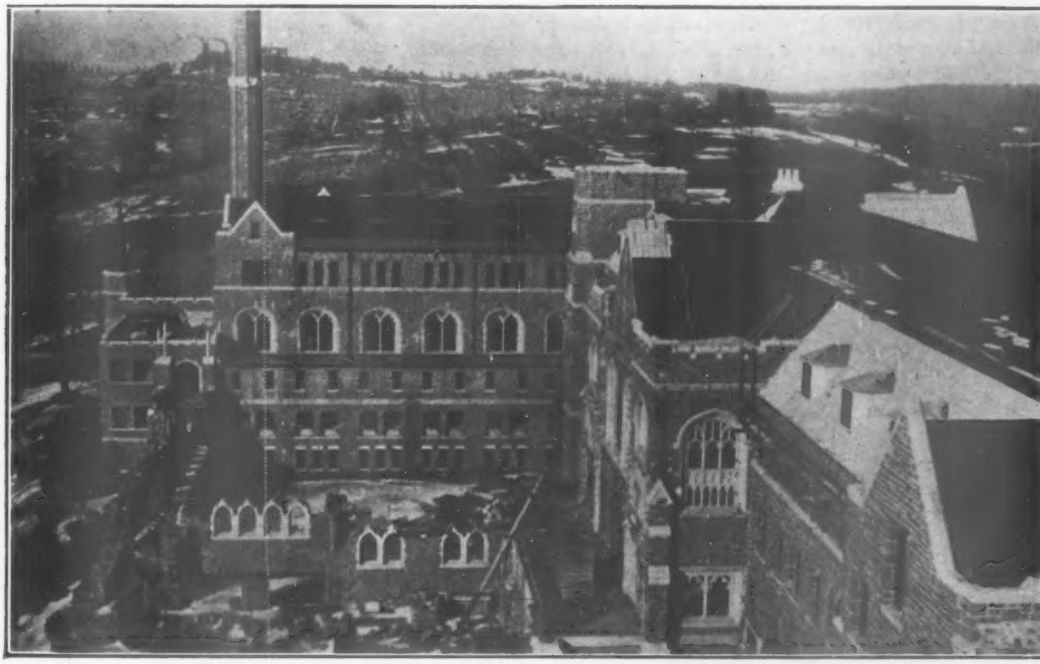


PLATE 4. FACULTY AND LIBRARY BUILDING FROM THE SOUTH, SHOWING PASSAGEWAY UNDER CONSTRUCTION CONNECTING CHAPEL WITH NORTH WING OF GROUP

Relation of the Buildings to Each Other

Plate 3 shows the relation of the group described above to the other college buildings, and to the campus. The building at the top is the administration building and contains the offices of the president, college deans, treasurer and registrar, and classrooms. Facing south, the direction of the city, it occupies a prominent position overlooking the Missouri River nearly 200 feet below the hill to the east. The north base of the water-tank shown indicates approximately the south wall of the group of buildings now under construction and described in the earlier paragraphs. The stack has served for many years the central heating-plant and will presently be demolished. The tank will likewise be removed in the near future.

The second building shown in the plate gives the south and west views of the gymnasium, well equipped and modern throughout. At the time of its construction in 1922, it was the largest gymnasium in the Mid-West. The main floor contains three basketball courts which can be used simultaneously for intramural games. At one end of the main floor is a large stage for dramatic productions, thus making it possible to use the gymnasium floor as an auditorium, with seating capacity of 2,500. The building likewise contains numerous clubrooms, bowling-alleys, swimming-pool, dressing-rooms and shower-baths, physical examination rooms and athletic storerooms. Note especially the convenient location of the gymnasium to the campus.

In the foreground on the middle terrace are four tennis courts surrounded by a 12-foot fence of iron. The lowest terrace is a football field used for intramural games. Another campus for baseball is seen at the extreme right of the picture just south of the gymnasium. North of the tennis courts and football field is to be located the stadium. When the grading for this is completed (very little grading will be required), the bed of the stadium will be approximately 25 feet below

the grade level of the gymnasium. The gymnasium was designed with the nearness of the stadium in mind. For that reason the open gallery on the second story was constructed, since it would afford special visitors a convenient place from which to view the athletic contests. A device often employed by architects to set off a building or group of buildings is the use of terraces. Note the terrace effect in plate No. 3. The difference in elevation between the lowest level shown in this view and the ground level of the administration building is approximately 85 feet. Another group of buildings, mostly residence halls for students, is located to the rear of the spot from which the above photograph was taken.

The approach to the administration building (the building at the top of plate No. 3), from the south is likewise characterized by a series of terraces, four in number, the difference in elevation of each terrace being about 12 feet. These terraces are artistically decorated with floral designs and shrubbery. Along the extreme upper edge of the bluff is a winding drive affording an unusually pleasing view of the Missouri River on the right, and of the college campus and buildings to the left. The river is less than 600 yards from the drive and lies nearly 200 feet below.

The Suggestion of Inaccessibility

With the above general description fixed in mind, we are in a position to enter upon a discussion of the specific features of the main group. We shall begin with the building site. The selection of the building site for the group of buildings here described is in accord with the traditional practice of the Middle Ages. It is a well-known fact that the Benedictine Order during the Middle Ages established monasteries and monastic schools in the wild lands of Germany and North Europe, converted the barbarians, cleared the ground, established permanent agriculture, and built refuges for the people against barbarian invaders who were constantly sweeping over the civilized outposts. For defensive purposes these early monasteries and monastic schools were built in well-nigh inaccessible places. The monks selected spots high up in the mountains, protected on several sides by precipitous slopes, the only approach in many cases being very narrow and steep, winding roads. The monastery often took on the appearance of a fortress—the buildings being constructed of stone many feet thick, surmounted with towers and turrets as a means of defense. Frequently, too, the buildings were enclosed by high stone walls with towers and turrets. Not infrequently a moat extended partially or completely around the exterior walls.

This idea of inaccessibility is marvelously represented in the building site selected for the group of buildings at St. Benedict's College. A preceding paragraph showed that the group is situated on the crown of the bluff overlooking the Missouri River, 200 feet below. The edge of the bluff at the nearest point is 75 feet from the east foundation walls of the building, the declivity being precipitous in character. In some places, the slope is vertical, the fall varying from 30 to 60 feet. At other places the slope is more gradual and trees and shrubs abound. Plate No. 3 shows the topography of the west side of the building site, while the terraces to the south of the administration building spoken of in the preceding paragraph, which lie south of the administration building, complete the picture—an artistic as well as realistic picture of *inaccessibility*. The idea of the moat surrounding the fortress walls is suggested by the Big Muddy, which so closely follows the base of the mighty bluffs. Whether one approaches the group of buildings from the south, east or west, the unmistakable impression is one of inaccessibility.

The Effect of Massiveness

The idea of *massiveness* of the medieval monasteries for defensive purposes is embodied in the group of buildings under construction by the thickness of the walls,—three feet down to two feet,—by the protecting walls which enclose the inner courts on the west side, by the numerous turrets, and, in particular, by the main tower, which is buttressed by four walls of solid masonry, nine feet thick. As mentioned before, the monasteries of old were frequently enclosed by walls of solid masonry.

Plate No. 4 shows how this idea is to be incorporated in this group. At the left of the plate, note the incompleted section of what appears to be a wall nearly 12 feet in thickness, which forms the west wall of the inner court. In reality, this is to be a passageway connecting the chapel with the north wing of the group. When viewed from above, this passageway will convey the impression of a thick wall. In the center of the inner court is a large cistern with capacity sufficient to receive the drainage from all buildings of the group. This idea is likewise a relic of medieval days. Forced as the monks were to build high up on the mountain side, they frequently found themselves without a supply of water, which then had to be obtained by artificial means.

The idea of a fortress is still further developed and completed by the introduction of portholes here and there, which in the modern building serve useful purposes. Plate No. 4 suggests another relic of medieval days. Note the chimneypots, which give the appearance of telescopes turned heavenwards. The early monastic schools or abbeys did not have the conveniences of a central heating-plant. They were forced to make use of local heating facilities and hence had to provide numerous flues in the various parts of the building. This idea has been incorporated in the above group by means of four sets of chimneypots, three sets having triple pots, and one set having two such pots. These chimneypots likewise serve an architectural purpose, since they

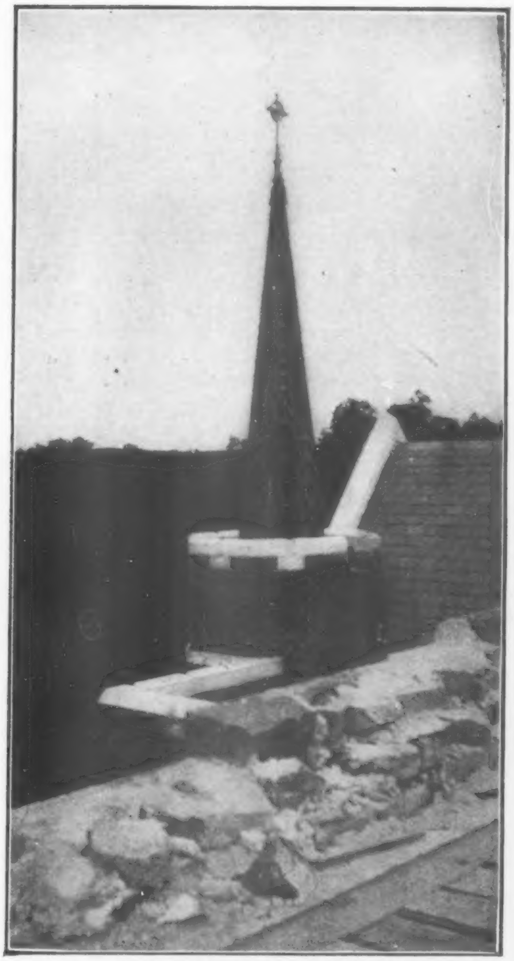


PLATE 5. A SPIRE CHARACTERISTIC OF A MEDIEVAL COUNTRY CHURCH

relieve the monotony which would otherwise result from the long, unrelieved roof expanse.

The Idea of Permanency

The massiveness of the entire structure, as well as the selection of stone as the building material, embodies another idea besides that of defense and safety spoken of in the preceding paragraph This is the idea of *permanency*. The Benedictine Order, the oldest in the Church, has continued to endure for more than fourteen hundred years. Whenever the monks entered a new field—whenever they went forth from their home to push back the boundaries of civilization—they built a home that was intended to withstand the ravages of time. History bears out the statement that many of these monasteries were preserved and used by the monks for many centuries. Hence arises the tradition that when monks build a home in any particular spot, they intend to remain there. Stability is one of the ideals which is associated with the Benedictine Order; it is one of the ideals which the founder of the Order incorporated into the Rule which he gave his disciples. This idea is artistically embodied in the above group, as any observer will testify.

Other Special Features of Construction

We have seen that the monasteries of the medieval periods were frequently enclosed by walls. Somewhat removed from the main buildings and nearer the walls, were the out-buildings, the residence quarters for the retainers, the workmen, and the artisans. These buildings were usually constructed from the left-over material, which was poorer in quality and in architectural design than the main buildings. This idea has been incorporated in the group under dicsussion by the use of exterior brick in the construction of the extreme north wing, the quarters for the kitchen attendants.

At one period in early English architecture country churches could not be built with a spire. The spire was a privilege of the cathedral church alone. Later on, towers were tolerated, but, to distinguish the country church from the cathedral church, the spire had to be set-in somewhat from

PLATE 6. SHOWING ONE OF THE TRACERY WINDOWS OF CARTHAGE STONE, AND THE TYPE OF MASONRY

Barnett, Haynes and Barnett, St. Louis, Mo., Architects

PLATE 7. ENTRANCE OF ADMINISTRATION BUILDING

the edge of the wall. Furthermore, the towers and spires of country churches had to be lower than was allowed for the cathedrals. Plate No. 5 shows one of these medieval spires. Note the set-in effect. This particular spire indicates the position of a chapel intended for the use of the kitchen attendants. It is made subordinate to the main chapel, which has a turreted tower, 165 feet in height.

This tower is balanced by the tower-like smoke-stack on the north wing—a work of art in itself. Built entirely of stone with cut-stone trimmings, having forty-two edges to relieve the otherwise monotonous circular appearance, this stack gives the unmistakable impression of an ornamental tower which harmonizes exquisitely with the group. A piece of cord drawn around the tower in such a way as to exactly fit into all the indentations would measure 45 feet.

The windows in the building are masterpieces of workmanship, as plate No. 6 will show. This view likewise gives a splendid illustration of the exterior masonry. The outstanding feature in the construction of this building has been the method employed. The building committee was most anxious to employ a plan that would permit the stopping of the work at such time or times as their finances dictated, and the method employed to bring about these results was the elimination of the contractor method of building, and the erection of the building by the owner with the assistance of the architect's superintendent. All material was purchased either raw or fabricated, and discounts taken.

A special siding was constructed, an inclined railroad built to raise the material to the bank level, and a system of industrial tracks laid to haul the material from the ground to the various parts of the building as needed. By this method, materials were handled at an extremely low cost per ton, and very rapidly. Actual figures show that the cost per ton of the local stone, including the transportation, was $2.85, an exceedingly low cost, as any architect will testify.

Another feature of the construction deserving mention is that all of the stone was cut and shaped on the premises. A stone-yard was built, with planers and air-compressors installed for cutting the stone. Lime pits were built for slacking lime, and all materials were bought in large quantities to insure low price, as ample facilities were provided for storage. No labor troubles developed, and a fine spirit prevailed among all the workmen. The workmen seemed to be motivated by nobler ideals than is usual in this materialistic period. They appeared to be impressed with the idea that it was a privilege to be allowed to assist in the construction of a work of art, and as a result they took genuine pleasure in their work and honestly attempted to make each stone placed in the wall contribute toward the beauty of the whole.

The Administration Building in Close View

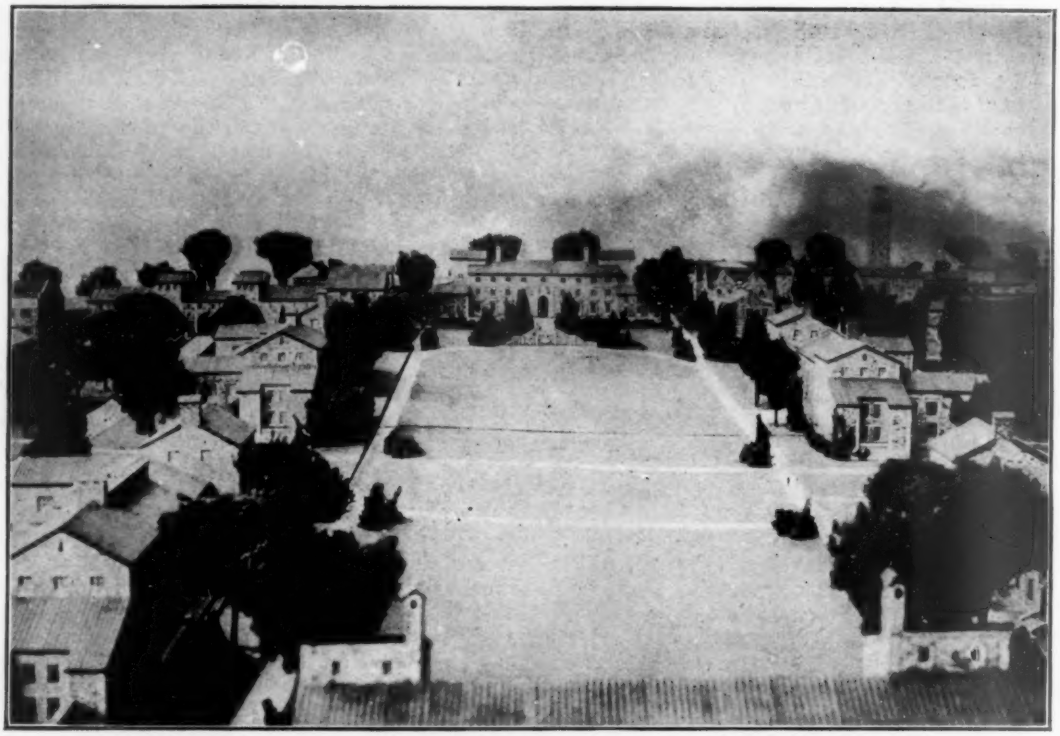
To conclude this article without giving a closer view of the administration building together with the symbolism embodied, would be to overlook one of the architectural features of the institution. The trees, shrubs, and floral decorations around this building would do credit to a botanical garden. Of trees alone, surprising as it may seem, there are more than 60 varieties. The artistic effect of these trees, shrubs, and floral designs must be seen and observed to be appreciated. No picture can do justice to the scene.

The entrance—a fine example of Tudor Gothic—is shown in close view in plate No. 7. Note the figures of stone carved in the panneling just above the entrance. These figures represent scholarly monks of the Middle Ages, a host of whom had distinguished themselves in the fields of arts and sciences. High above these is a marble statue—Italian marble—of the founder of the Order, St. Benedict. In front is the fountain with its four streams all flowing into the one basin. What an appropriate setting for an institution of higher learning, a College of Arts and Sciences. The four streams of water symbolize the four fountains of knowledge, Arts, Fine Arts, Natural Science, and Religion or Theology. The four monks in stone represent monks who have distinguished themselves in these four fields; the four streams flowing into one basin thus forming a single mass represent the idea that culture is the product of a happy combination of knowledge obtained from all of these fields. The position of prominence given to the founder of the Order, together with his attitude,—*oculis ac manibus in coelum*,—symbolizes the idea that the ideals of the Order should predominate over all the activities of the monks. That is to say, whilst the monks were encouraged to pursue their studies of the various arts and sciences to the highest possible degree, nevertheless these studies and these activities are to be directed to the attainment of the ideals for which the Order was established, namely, the perfection of individual character.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Auditorium Seats—American Seating Co.
Blackboards—Peabody School Furniture Co.
Boilers—Kewanee Boiler Co.
Cafeteria Equipment—The Albert Pick-Barth Companies
Classroom Furniture—Abernathy Furniture Co.
Clocks and Signal Systems—The Standard Electric Time Co.
Drinking Fountains—Kohler Co.
Heat Regulating System—Minneapolis Heat Regulator Co.
Lockers—Durabilt Steel Locker Co. and Lyon Metal Products Co.
Plumbing Fixtures—Standard Sanitary Mfg. Co.
Sanitary Equipment—Hillyard Chemical Co.
Shop Equipment (electrical)—Graybar Electric Co.
Shower Partitions—Henry Weis Mfg. Co.
Valves—Crane Co.
Windows and Sash—Crittall Casement Window Co.

For articles on college building architecture in the first edition of The American School and University, see "The School and Its Architect," page 15; "Skyscraper Design Essential to University's Social Service Program in Chicago," page 17; "The Building and Organizing of Duke University," page 23; "Texas Technological College, Lubbock, Texas," page 66; "The Union and the League," page 71; "The Field House of the University of Iowa," page 193.



A PORTION OF THE MODEL OF THE UNIVERSITY OF COLORADO CAMPUS
Five buildings have been constructed in this style of architecture

Organization and Activities of the Construction Department of the University of Colorado

BY W. E. BROCKWAY

SUPERVISING ENGINEER, UNIVERSITY OF COLORADO

and

R. W. LIND

CONSTRUCTION ENGINEER, UNIVERSITY OF COLORADO

PREVIOUS to 1917, money for new buildings at the University of Colorado had been provided at irregular intervals, appropriations being made for each building by the State Legislature. Since no comprehensive plan for the development of the campus had been made at that time, this led to a diversity in style of architecture and a lack of unity in the plan as a whole.

In 1917 the Legislature provided funds for new buildings at the State University by means of a mill levy tax extending over a ten-year period. With funds assured for a program of development, the University retained Day & Klauder of Philadelphia, architects with skill and experience in university work, to prepare a plan for the development of the campus, and to draw plans as required for the buildings to be constructed.

The University of Colorado is siuated in Boulder, a small city at the eastern edge of the Rockies. High forested mountains rise from the city's edge. These surroundings suggested to the architects a style of architecture similar to that found in the mountainous regions of Italy. Quarries of hard, brightly colored sandstone nearby offered a building material admirably suited to the development of this style. Walls of this beautifully colored native stone, laid roughly in long, thin pieces, when combined with mottled red tile roofs, harmonize well with the rugged mountain background and the blue Colorado sky.

In order to assure a future supply of building stone, the quarries were purchased by the University. Five buildings have been constructed in this style with very gratifying results.

Construction Department Organized

Until this time all building work at the University had been done by general contract. The plans for the first building designed by Day & Klauder, a women's dormitory, were put out for bids; but, owing to the fact that the stone work and other features were unusual, all bids appeared to be too high and all were rejected. The building was never built. After this experience it seemed best to provide within the University an organization for carrying on work of this kind at a minimum cost. Accordingly a Construction Department was organized. While the activities of this department were at first confined to the construction of new buildings, it later took over the work of the Buildings and Grounds Department.

The organization of the Construction Department now consists of a Supervising Engineer who has charge of new construction work and the care of the entire physical plant, an Engineer who acts as superintendent on new buildings, foremen of the various building trades, and office help as required. Since the duties of the personnel of this department include the care of the physical plant, their services would be required even though no new construction work was in progress. For that reason the additional overhead expense of maintaining an organization for construction work is very small. On account of the facilities which the Construction Department provides, both in skilled workmen and in equipment, maintenance and remodeling work can be carried on at less expense than would otherwise be possible.

Plans

As was pointed out above, all general plans for buildings which have been constructed in the new style of architecture have been prepared by Day & Klauder, architects, of Philadelphia. The heating and ventilating, plumbing and electric plans have been prepared at the University, either by the Construction Department itself or by the Construction Department assisted by members of the Engineering faculty. In some cases the structural plans have been prepared by the architects, and in other cases by the Construction Department. In the planning of new buildings, faculty committees working with members of the Construction Department draw up carefully worked-out specifications and sketches to be used by the architects in preparing plans.

LIBERAL ARTS BUILDING, UNIVERSITY OF COLORADO

Estimates

Detailed estimates are made for all new construction work. These estimates are kept up to date as the work progresses. Complete cost records on all completed buildings give valuable information for use in estimating.

Construction

The Construction Department acts in the capacity of a general contractor in the erection of new buildings. All excavation, concrete, masonry, carpentry, plumbing, heating, electrical, sheet metal, iron and painting work is done by workmen employed directly by the University. Plastering, tile, marble, and terrazzo are usually let to subcontractors.

The stone quarries are operated by the University. The waste from the quarries is crushed and used for concrete. Sand is secured from sandpits owned by the University.

All materials and supplies are purchased through the University Purchasing Department. By combining the purchasing of materials for new buildings and for maintenance, additional volume is secured with correspondingly better discounts.

Cost Records

Complete cost records are kept of all new construction work. The system used in keeping these records is patterned after that used by many large contracting firms. Numbers are assigned to each class of work, with sub-numbers for the different divisions of labor and material. All time and material are charged directly to the proper account number, and the complete record of expenditures under each account number is kept up to date in a card file. These records not only furnish information concerning the progress of the expenditures in each branch of the work, but also provide a storehouse of information for the estimator.

Costs

The cubic-foot costs of the five buildings constructed under this plan range from 30 cents to 42 cents. These buildings are fireproof and of high-class, substantial construction. It seems reasonably certain that the construction work carried on at the University under this plan has been done at a considerable saving over what could have been expected had a separate contract been let for each building.

Conclusion

The plan of having the work of the Buildings and Grounds Department and the construction of buildings carried on by one department and one organization has been very satisfactory at the University of Colorado. Many advantages result from this arrangement. Continuity of work in maintenance and new construction has attracted to the University high-class employees. The operation of stone quarries, stone crushers, and sandpits can be carried on more economically when there exists a definite program extending over a number of years than could be done under periodic operation by different individuals.

Through the employment of high-class mechanics and the purchasing power of a large institution, construction costs can be kept at a minimum. Overhead is but little higher than for maintenance work only, and there are no contractors' profits. The inevitable changes during construction can be made at a minimum of expense, thus avoiding the large and annoying lists of extras. Close contact and cooperation between construction engineers and faculty members enable details to be carried out in conformity to the ideas of the people who are to use the building. The quality of the construction work is under control of the same men who are to maintain the buildings, and there is every possible inducement to do the work in the best possible manner.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

For pictures of the construction of the gymnasiums of the University of Colorado, see page 214 of this issue.

THE MOST RECENT BUILDINGS OF THE MERCERSBURG ACADEMY, MERCERSBURG, PA.

A New Main Hall and Annex

BY BOYD EDWARDS

HEAD MASTER, THE MERCERSBURG ACADEMY, MERCERSBURG, PA.

THE new Main Hall and Annex of The Mercersburg Academy were opened in January, 1928. They replace the original building of Marshall College, later used by Mercersburg College and The Mercersburg Academy. The original building was built in 1836.

The new Main Hall was designed to conform to the general lines of the original building. The architect was Charles Z. Klauder, of Philadelphia, and the contractors were J. B. Ferguson & Company, of Hagerstown, Md. The building includes dormitories on the three upper floors, with recitation rooms on the first floor. It also includes a library to be housed until the special library building, already designed, is erected.

The Annex houses an assembly hall, dormitory quarters on the top floor, and on the first floor, which is half basement, there is a Masters' clubroom, two study halls and special rooms for the school Senate, the school paper and music practice rooms. The assembly room in the Annex is so constructed that when a large and permanent assembly hall, planned by Dr. Irvine, to be called the Hall of Chivalry and to house the records and tokens of the school's history, is completed, a floor can be put into the assembly hall for additional dormitory use.

The structure is fireproof throughout and very ingeniously devised to provide a maximum space for classrooms, all well lighted at side or rear.

A Score Card for Normal School and Teachers College Buildings

BY E. S. EVENDEN

PROFESSOR OF EDUCATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

ANY one who has visited a number of normal schools and teachers colleges in this country will be impressed by the great variety of their physical plants. Not only does this variety exist between the plants of two different schools, but it is equally noticeable among different buildings of single plants. This heterogeneity can be partially explained, though the explanations cannot be used to justify it.

Why These Plants Are Heterogeneous

One of the explanations comes from the methods by which normal schools and teachers colleges were started in many states. Humphreys[1] found in his study of the factors operating in the location of state normal schools that many of the present schools are being operated in plants that were originally donated to the different states by college or academy organizations which for one reason or another could not continue to maintain their institutions. In this way these normal schools or teachers colleges started with buildings and sites that were probably poorly adapted to the uses of the schools which failed in them, and that were even less suited to the specific needs of a school for the preparation of teachers. Gullible legislatures, which thought they were getting something for nothing, have, in most instances, been paying an annual "bonus" to cover the extra costs of poorly adapted buildings with constantly increasing upkeep cost, to say nothing of the bonus paid by the students and the parents of the students because of the poor location of these sites, with resulting extra railway fares and the expenses of living away from home.

Another explanation is to be found in the upgrading of these schools which has taken place in the ninety years since the first state-supported normal school was established at Lexington, Mass. The earliest state-supported normal schools had virtually one-year courses, although it was expected that the complete course would require three years.[2] It must be remembered, however, that the students entered from what would now be the elementary schools. The normal schools at that time and for several years following were not only on the secondary level, but on the lower secondary level. Since that period, these schools have gradually increased their entrance requirements and lengthened their curricula until today the "typical" or "modal" state-supported institution for the preparation of teachers is a teachers college, requiring graduation from a standard high school for admission and offering a four-year collegiate course leading to a baccalaureate degree.

It is easily seen that with each change in level the schools were compelled to offer new courses and provide new facilities in the way of laboratories, gymnasiums, dormitories, libraries and other physical plant features. In too many instances these additional needs have been met, if at all, by remodeling some existing room or building, and the result is painfully evident in the physical facilities and equally painful, though less evident, in the limited professional equipment which the prospective teachers secured in these makeshifts. The teacher-training institution with over 1,500 students, using as a gymnasium an old, discarded wooden-frame church which shook from cracked foundation to shingled roof peak with the exercises of any class, is an illustration of the limitations under which some of these schools have been working.

The Influence of School-Building Score Cards and Standards

Only a few years ago the same general conditions existed in most of our public school buildings, the older of which buildings were no longer adapted to present-day curricula and were neither safe nor sanitary. The tremendous changes which have taken place in public school buildings have in large measure been brought about by the use of school-building score cards and standards. Professors George D. Strayer and N. L. Engelhardt of Teachers College, Columbia University, were among the first to develop such score cards and standards,[1] and have used them in connection with their work in school surveys and school-building programs in all parts of the country. The improvements of public school buildings in this country—one of the notable achievements of America in the last two decades—is due in no small measure to the work of these two men and the numerous students who secured training with them.

It may be profitable to mention some of the general values of such score cards and standards, since the same values will result from the use of similar standards for normal schools and teachers

[1] Humphreys, H. C.: "The Factors Operating in the Location of State Normal Schools," Bureau of Publications, Teachers College, Columbia University, 1923.

[2] Mangun, V. L.: "The American Normal School," Warwick & York, 1928.

[1] Strayer, G. D., and Engelhardt, N. L.: "Standards for Elementary School Buildings"; "Standards for High School Buildings"; and "Standards for Village and Rural School Buildings of Four Teachers or Less." Bureau of Publications, Teachers College, Columbia University, New York City.

colleges. A quotation from the Survey of Lutheran Colleges[1] presents these general advantages and applies equally well to the physical plants of normal schools and teachers colleges:

"In making studies of school buildings and developing school-building programs it has been found very helpful to use a building score card as a means of diagnosis and comparison. This has been found more accurate than any other method of study for the following reasons:

"1. It gives an easily understood basis for comparisons between different plants. To say that a building is a 'very good' building may mean one thing to one person and another thing to a second person. There is no such range of interpretation, however, when you say that a certain building receives a score of 700 on the basis of a possible 1,000 points. In the same way it is less definite to say that the physical plant of College A is 'somewhat better' than that of College B than to say that the physical plant for College A scores 550 and that of College B 600 on the basis of a possible 1,000 points. It might be truthfully said that 'one college was considerably better than another' if one scores 200 and the other 300, as it might also be said if one scores 700 and another 800, and yet it is evident that the statement tells only part of the story. In the first case both plants are practically useless, while in the second case both are good plants and have many excellent features.

"2. Because score cards list all the important features, their use practically guarantees that all these features will be considered in evaluating the plant. This is very essential when the thing being judged is complicated with as many varying elements as the physical plant of a modern college. Since a score has to be given to each of the items before the total can be found, it prevents the overlooking of any of them.

"3. Because all the items on the score card have been given a relative weighting by competent judges, its use guards against personal bias by the scorers. No matter how important any scorer may consider any particular item, he cannot give more weight to it in making the final score than the weight assigned to it on the score card.

"4. By having three different persons score each set of buildings independently and using the median score of the three scorers on each item, it is possible to guard even further against any tendency which any scorer might have to score too severely or too liberally.

"5. The diagnostic value of score cards is probably the chief justification for their use. It is relatively easy after studying the scores allotted to a college plant to discover its weak and its strong points and the best method of improving the elements which receive the lowest scores. Some examples will make this diagnostic value more evident and show its relationship to any 'building programs' which are to be undertaken. Suppose a college physical plant receives a score of 750 out of a possible 1,000 points. It may be a college plant which receives an almost perfect score on most of the items but because of the failure to provide adequately for its library, its science work, and domitories, its total score is materially lowered. All of these items can quite easily be remedied and the score considerably raised. If, on the other hand, the score was lowered by a poor location of the college, that item cannot in most instances be remedied. It is quite possible that a score may be lowered, not by heavy loss from a few items, but by small deductions on many items —old, poorly adapted buildings without modern improvements will lower a total score, even though every needed building is provided. This will call for a very different building program from the first case cited."

[1] Leonard, R. J., Evenden, E. S., O'Rear and Others: "A Survey of Higher Education for the United Lutheran Church in America." Bureau of Publications, Teachers College, Columbia University, 1929.

A score card with accompanying standards for normal schools and teachers colleges has been developed in connection with the work in the administration of normal schools and teachers colleges at Teachers College, Columbia University, and in collaboration with Professors G. D. Strayer and N. L. Engelhardt. The study has been approved by the Committee on Standards and Surveys of the American Association of Teachers Colleges. The weightings for the items in the score card have been determined by the median judgments of 250 teachers and administrative officers of normal schools and teachers colleges from every section of the United States. The standards which accompany the score card have been approved and refined by this same group. They will in the near future be still further refined by the judgments of the presidents of the normal schools and teachers colleges who are members of the A. A. T. C.

There will be a large number of new buildings erected for normal schools and teachers colleges within the next few years, to replace existing unusable buildings, to supplement inadequate buildings or as some institutions are moved to more advantageous locations. In order that these new buildings may be built to provide for as long a period of usefulness as possible, to guarantee that they are well adapted to the special needs of the schools and to prevent the repetition of mistakes now known to exist in present buildings, it is suggested that teachers college presidents, boards of control, and consulting architects make use of the above score card and standards.

A few examples of elements which should be considered in any building program for a teachers college, but which are frequently overlooked, will be given to illustrate the practical value of the score card and standards as a check and guide to those in charge of such building programs, since its use would at least guarantee that such elements were not omitted because they were forgotten.

Essential Practice-School Facilities

A normal school or teachers college must have adequate practice-school facilities. These bear a definite relationship to the size of the school and the length of the curricula. The location of such an institution should be selected with these facts in mind, in order that the required number of children in the different grades may be easily obtained for the practice schools. Many of our normal schools and teachers colleges are now located in places so small that if all the children in the city were enrolled in the practice school, it would still not be large enough to meet the minimum standards set by the American Association of Teachers Colleges. Another factor related to the practice school is the securing of enough space on the campus for the convenient location of the

SCORE CARD FOR PHYSICAL PLANT OF NORMAL SCHOOLS AND TEACHERS COLLEGES

BY

E. S. EVENDEN
GEORGE D. STRAYER
AND
N. L. ENGELHARDT

Name of School.......................................Date...............

City .... State.......... Scorer..............

INSTRUCTIONS FOR USING CARD—(1) Basis for scoring, 1000 points. (2) For scoring, three columns are allowed. While actually scoring a physical plant only the first need be filled out, the second and third to be filled out at leisure. (3) The weighted score for each item is either five or a multiple of five, permitting the use of a five-point scale of evaluation in scoring each item. (4) A score of zero on any item indicates the absence of that item. (5) Where credit is allowed for any single item not present and not needed in a physical plant, draw a circle around such credit. (6) All scores should be recorded on the basis of the standards outlined in the bulletin: "Standards for Physical Plants of Normal Schools and Teachers Colleges" by E. S. Evenden, G. D. Strayer, and N. L. Engelhardt. Published by Bureau of Publications, Teachers College, Columbia University, New York City.

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NEW YORK CITY

SCORE CARD FOR PHYSICAL PLANT OF NORMAL SCHOOLS AND TEACHERS COLLEGES

Evenden-Strayer-Engelhardt

	1	2	3
I. SITE			110
A. Location		45	
1. Accessibility	25		
2. Environment	20		
B. Nature and Condition		20	
1. Drainage	5		
2. Landscaping and upkeep	15		
C. Size and Form	45	45	
II. BUILDINGS			155
A. Placement		30	
1. Orientation	5		
2. Campus plan	25		
B. Gross Structures		55	
1. Type and architectural harmony	10		
2. Material	15		
3. Foundations and supporting walls	5		
4. Roofs	5		
5. Entrances	5		
6. Window placement	10		
7. Condition	5		
C. Internal Structure		45	
1. Stairways and "stairwells"	15		
2. Corridors	10		
3. Doors	5		
4. Basements and attics	5		
5. Modifiability	10		
D. Interior Finish and Decoration		25	
1. Floors and woodwork	5		
2. Walls and ceilings	5		
3. Color scheme	5		
4. Condition	10		
III. SERVICE SYSTEMS			175
A. Heating and Ventilating		35	
1. Kind and installation	10		
2. Special provisions	5		
3. Effectiveness	20		
B. Fire Protection		40	
1. Fireproofness	20		
2. Apparatus	5		
3. Exits and escapes	10		
4. Special provisions	5		
C. Cleaning System		10	
1. Kind	5		
2. Installation and use	5		

PAGES 1 AND 2 OF THE NEW SCORE CARD

practice school with respect to the principal buildings of the teachers college, and to give it a typical separate protected playground, in order that it may have its own play program, preserve its autonomy as a public school, and develop a school spirit independent from that of the college.

Still another item connected with the practice-school building is provision for smaller practice rooms grouped about the several grade rooms. These are necessary in order to permit more than one student teacher to practice in a given grade during any hour. These rooms must be so arranged as to permit close supervision of all of them by one supervisor. Several such arrangements have been tried over a period of years and found very satisfactory and economical of space. Some of the better of these arrangements are shown in the standards. The need for special conference rooms for practice teachers and supervisors is often overlooked in planning these schools, since such needs do not exist in the regular public schools which are too frequently used as models for these practice schools.

Adequate Libraries Needed

An additional example of failure to plan these buildings in terms of the work done in them is often found in the inadequate provision or lack of provision for library facilities. Much of the real work of these schools is now being done in the libraries, and more of it will be done there in the future. Regardless of this admitted fact, libraries in our normal schools and teachers colleges are very meagerly equipped with books and periodicals, and often the reading space is not adequate for half of the students who may be expected to use it at the peak-load periods. Moreover, the stacks are practically never protected from fire hazards and are often put in unprotected rooms in the center of the building, where they would certainly be destroyed in case of fire. As the libraries are developed, they not only represent a large investment in actual capital, but often contain material which cannot be replaced. Libraries should be housed in separate fireproof buildings or in an independent fireproof unit of

	1	2	3
D. Artificial Lighting		15	
1. Kind—gas and electricity	5		
2. Installation and outlets	5		
3. Fixtures and illumination	5		
E. Water Supply System		20	
1. Drinking	5		
2. Washing	5		
3. Bathing—showers	5		
4. Hot water supply	5		
F. Toilet System		25	
1. Distribution	5		
2. Fixtures	5		
3. Adequacy	5		
4. Seclusion	5		
5. Sanitation and care	5		
G. Other Service Systems		20	
1. Electric (clocks, 'phones, radios, etc.)	10		
2. Mechanical (elevators, laundry, etc.)	5		
3. Locker system (home & gymnasium)	5		
H Service and Storage Rooms.		10	
1. Work & sup. rms. rec'v'g, ship'g, etc.	5		
2. Fuel and other storage rooms	5		
IV. Instruction Rooms (Class and Laboratory)			220
A. Number (adequacy)	50	50	
B. Availability	20	20	
C. Size and Shape	25	25	
D. Natural Light (amount and control)	35	35	
E. Equipment		60	
1. Seats, desks and chairs	30		
2. Teacher's desk class. & dem'str'n	15		
3. Instructional equipment	15		
F. Blackboards and Special Features	10	10	
G. Teacher's Offices & Conference Rms	20	20	
V. Practice School Rooms			180
A. Number (adequacy)	40	40	
B. Availability	20	20	
C. Size and Shape		20	
1. Grade rooms	10		
2. Practice units	10		
D. Natural Light (amount and control)	25	25	
E. Equipment		25	
1. Seats and desks	15		
2. Teacher's desk	5		
3. Instructional equipment	5		

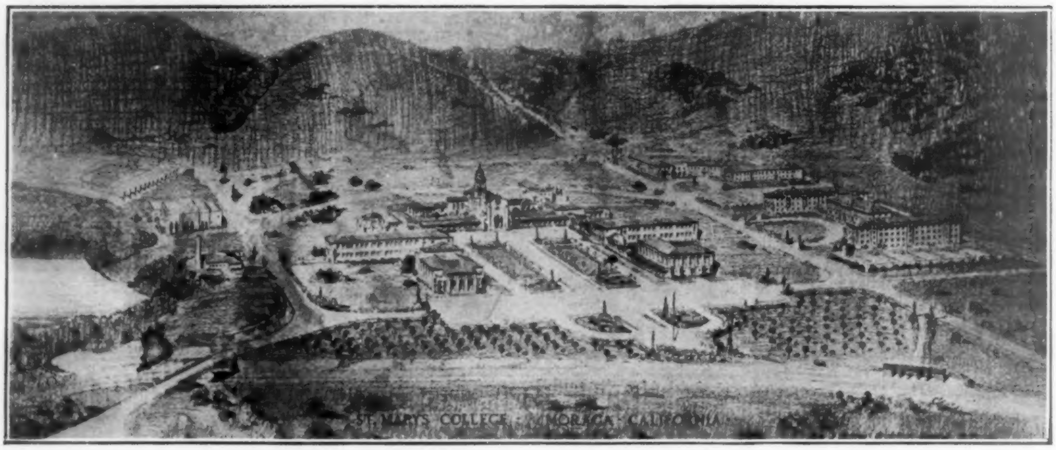
	1	2	3
F. Blackboards and Special Features	5	5	
G. Special Rooms for Practice School		45	
1. Office suite	5		
2. Library and study rooms	5		
3. Practice teacher's study	5		
4. Conference rooms	5		
5. Assembly rooms	5		
6. Health and rest rooms	5		
7. Gymnasium & physical education	5		
8. Lunch room or cafeteria	5		
9 Other special rooms	5		
VI. General Units			160
A. Administration		20	
1. Adequacy (number and size)	5		
2. Arrangement of rooms	5		
3. Office equipment & furnishings	5		
4. Record vault & special provisions	5		
B. Library		35	
1. Books, magazines and references	10		
2. Stacks	5		
3. Catalog	5		
4. Reading rooms and seminars	5		
5. Accessions and work rooms	5		
6. Offices	5		
C. Auditorium and Assembly Rooms		20	
1. Adequacy (number and size)	5		
2. Seating	5		
3. Stage and dressing rooms	5		
4. Special equipment	5		
D. Health, Recreation and Athletics		40	
1. Medical examination offices	5		
2. Infirmary and isolation unit	5		
3. Gymnasium	20		
4. Swimming pool	5		
5. Game courts and athletic fields	5		
E. Dormitories		35	
1. Adequacy	10		
2. Arrangement of rooms	5		
3. Dining rooms	5		
4. Kitchens	5		
5. Parlors and recreation rooms	5		
6. Office and special provisions	5		
F. Rest and Utility Rooms		10	
1. Rest rooms and lunch rooms	5		
2. Student activity rooms	5		
Total Score	1000	1000	1000

PAGES 3 AND 4 OF THE NEW SCORE CARD

a building and protected with automatic fire-doors between the stack-rooms and the main building.

Illustrations of neglect and oversight of essentials such as these can be found for almost every item in the score card. Enough, however, have been given to show the valuable contributions (both in money saved and in increased usefulness of the buildings) which can be made in the erection of future buildings for normal schools and teachers colleges if use is made of the composite best judgments of the persons whose experience in using such buildings is expressed in these standards.

For score cards relating to Repairs and Improvements (Rehabilitation) see pages 142-145 of this issue.



St. Mary's College—A New Group Under Construction in an Ideal Site

BY JOHN J. DONOVAN

ARCHITECT; MEMBER, AMERICAN INSTITUTE OF ARCHITECTS

A PLEASANT thirty-minute ride from the center of Oakland into Contra Costa County and through the Moraga Valley brings one to the new St. Mary's College at St. Mary's, Calif. The ride itself is picturesque and the scenery conducive to many pleasant thoughts and anticipations. Some day this time will be shortened, for tunnels are contemplated which will penetrate the mountains connecting the valleys on either side, so it will seem only a step from the enlarging East Bay Community to the new College.

Fortunate indeed is St. Mary's College in that it has a large acreage of beautiful rolling land—an ideal site for a university, and as one approaches the site it seems as though Nature offered her hand in preparation for the reception of this college which has so much in tradition and background and so much in prospect.

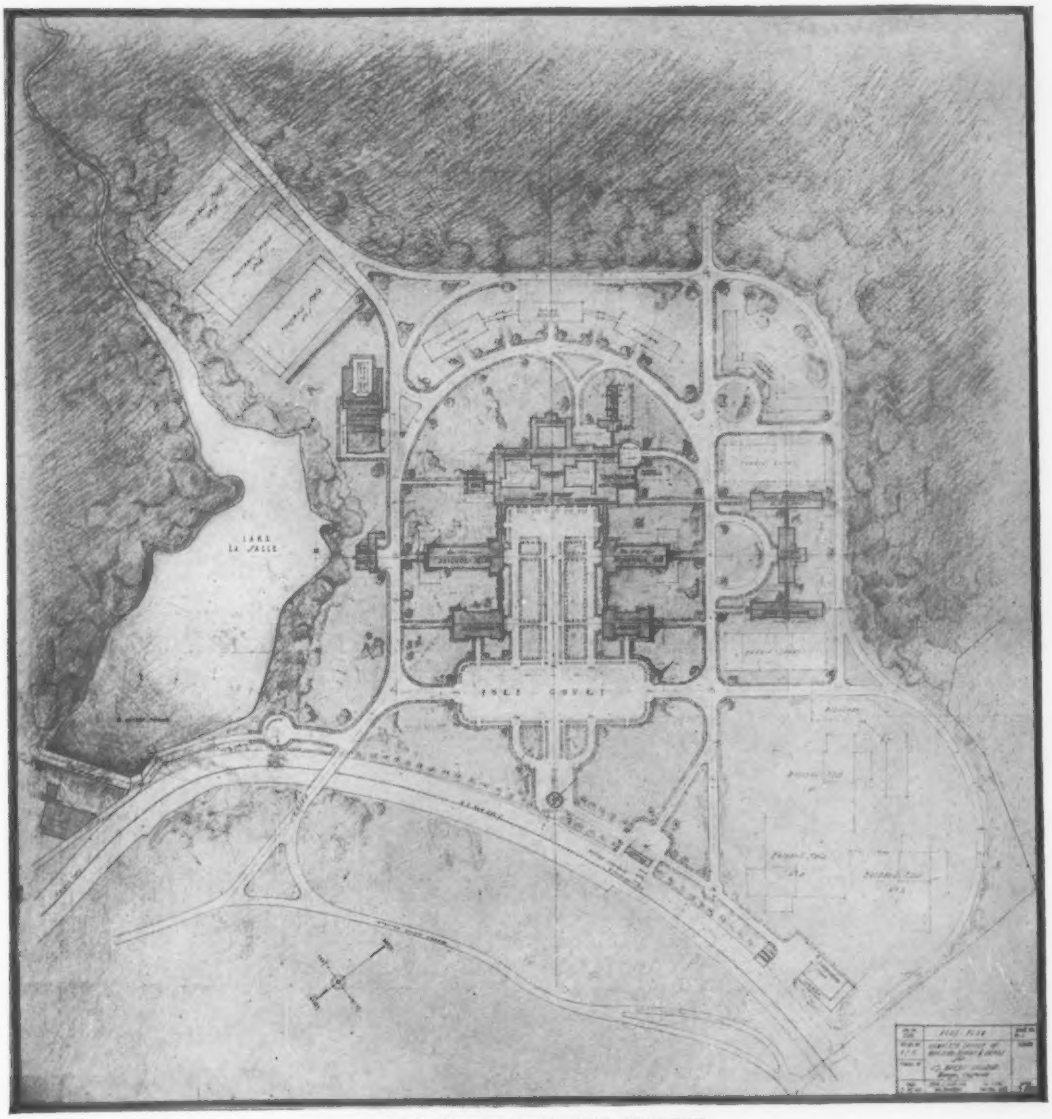
At the present time the group of buildings will provide for the educational and living conditions of approximately 1,000 students—one-half of whom will be resident and the other half day students. The land and the scheme of the general plan is such that enlargement with growth in the enrollment may be logical and accommodating to the present plant.

The General Plan

The general scheme consists of several groups of buildings—religious, educational, social, and accessory.

In the scheme and helped by nature is the

VIEW OF MAIN COURT, SHOWING SCIENCE BUILDING AND CHAPEL



PLOT PLAN OF ST. MARY'S COLLEGE

DORMITORY GROUP

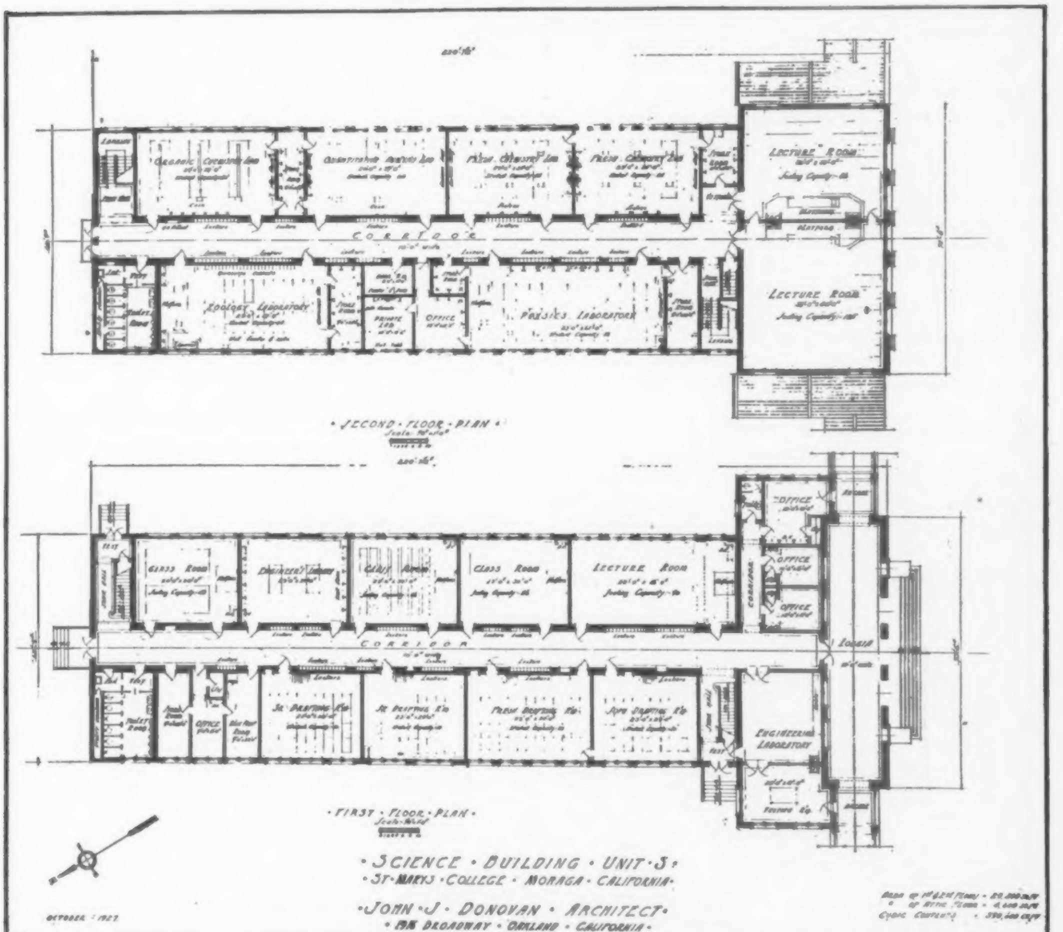
STUDENTS' LOUNGE IN ST. MARY'S COLLEGE

STUDENTS' DINING-HALL

newly created Lake De La Salle. A year ago construction of the dam was started, and today there is a beautiful body of water sufficient to provide for all the needs of the College and considerable to spare for development in and around the College site. From the distant hills, Lake De La Salle gives the impression of a brilliant sapphire in a gorgeous setting of evergreen oaks and multi-colored foliaged shrubs, and viewed from the distant hills this jewel seems ideally set with relation to the entourage.

while the arcades and buildings serve as an interesting perimeter to this division of the scheme. Below, or in front of the chapel group on either side, are the academic and science buildings, and farther down to the approach will be the library and the auditorium. All these buildings are connected with covered arcades.

Apart, but related to the whole, near the foot of the hills to the south are three dormitories where the resident students live. They stand out as the result of extensive research into college



dormitory planning, equipment, appointments and building. Students will have accommodations in these buildings, the environments of which can hardly be excelled.

The general plan is the result of contact and study extending over a period of six or seven years; it indicates familiarity with the religious and educational problems of the College and of the Brothers and students. There is the main court with the chapel as the central and predominating motive and the important accent to the architecture of the entire composition. To the right and left of the chapel are the administration building, Brothers' residence, dining-hall, Scholastics' residence, all forming a large rectangle with two spacious garden courts within,

To the northwest of the group of buildings and on axis with the science and academic building is the power-house close to the lake. Between the power-house and the football fields to the northeast is located the gymnasium. To the southwest and beyond the College buildings is a naturally formed stadium which is magnificent in its proportions and when developed to its full capacity

will be capable of easily seating 80,000 people. Three football fields have been constructed which for the present will serve for college games and ultimately for practice fields. Ground space has been left for two large baseball fields, tennis courts and courts for other games.

The scheme is an ordc rly one, yet free or modulating in form. It is one which is adaptable to the living and work of the Brothers and students.

The Environment

The expansive wooded hills and attractive winding valleys as time passes will serve for exploration ground for many generations of students and to them many of the interesting secrets of nature will be disclosed. This is an unique setting conducive to health, study and contemplation of the present and future, which is the rightful heritage of every student. The architecture is an attempt to add dignity and utility to this natural beauty.

The College is far enough away from the metropolitan districts of San Francisco and Oakland for the students to develop local interest in the social activities of the College and in its environments. This will contribute a great deal to the formation of habits and character.

The Architecture

A word regarding its architecture. Moraga Valley was settled by the early Spaniards who migrated from Mexico, and Don Moraga was the early great landholder. The very fact that the traditions of the country are colored with Spanish influence prompted the style of the architecture which has been followed but, not slavishly, and we have what might be termed Spanish-California architecture, lazily rambling and colorful, with white walls, blue trimmings and variegated tile roofs. The points of accent are decorated with motives symbolic of religion and education. The chapel might be considered a good example of Spanish-California architecture, with its high tower, arcades and columnar effect within. The science and academic buildings are quite educational in character, for their plan and design has been governed by the problems of the College and educational building principles. Adequate lighting, proper ventilation, correlation of departments and correlation of rooms attendant to each department have been the principles upon which this part of the work was solved.

The main dining-room will prove interesting both in plan and color. It is a room capable of seating approximately 475. The roof or ceiling spanning clear to the walls, a roughened beamed ceiling, high wood paneled wainscot and walls above of textured plaster sprayed with gold tint, are the main points of its design and finish.

The planning of the culinary division which will care for Brothers, Scholastics, students' cafeteria, clergy and visitors was a problem in itself, especially as one kitchen has to serve all of these dining-rooms and the cafeteria.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

INDEXES AND LISTS IN THIS VOLUME

* To make THE AMERICAN SCHOOL AND UNIVERSITY of the greatest convenience for reference purposes, the indexes to subjects and authors in the present volume have been made cumulative, so as to include also the edition of last year.

Provisions for Sanitation and Cleanliness in Educational Buildings

BY JAMES E. FOSTER

Plumbing & Heating Industries Bureau

WHEN planning the sanitary facilities for an educational building, one must consider:

The number of students
The sex of the students
The age of the students
Laboratory and recreational facilities
Administrative routine

A school to house 200 students will require less equipment than one that will provide for 1,000 students. Boys will require different equipment from girls. The equipment for a kindergarten will differ from that of a high school. Where laboratories, swimming pools, and gymnasiums are in use, additional lavatories are required. When morning and afternoon recesses are held, the toilet facilities will be different from those needed when only the noonday recess is granted.

State and municipal laws vary on sanitary facilities. For this reason, it will be impossible to discuss the legal aspects of this subject. Instead, attention will be directed to the general aspects of the problem, with occasional references to codes.

Some officials believe that the more students there are in a school, the greater the number that can be accommodated by a given fixture. They claim that the fixtures in a large school tend to be in steady use and that no large proportion of the students use them at any one time. Even in cases where a numerically large group of students might be using the equipment, they would represent a small proportion of the school's enrollment.

Requirements of Certain Codes

This theory is embodied in some codes. The Ohio building code, for example, gives the following maximum number of students to a given fixture:

Number of Students	Ratio of Fixtures to Students
Boys	Closets
1 to 100	1 to 30
101 to 200	1 to 35
Over 200	1 to 50
	Urinals
1 to 100	1 to 20
101 to 200	1 to 25
Over 200	1 to 30
Girls	Closets
1 to 100	1 to 15
101 to 200	1 to 20
Over 200	1 to 25

These figures may require some explanation. No matter how many students a school may have, the fixtures must be figured on the basis of the lower numbers upward. Suppose, for example, a school has facilities for 500 boys. Fixtures must be provided at the 1 to 100 and the 101 to 200 rates for a total of 200 boys and at the over 200 rate for the remaining 300 boys.

The principle of sliding requirements is not universally accepted. In some states, a flat ratio of students to fixtures is used. The Indiana code, for example, has the following requirements:

Closets (girls)	1 to 15 students
Closets (boys)	1 to 25 students
Urinals	1 to 15 students

The code prepared by the Michigan State Department of Public Instruction says:

"The number of toilet fixtures to be installed should not be less than one seat for each 15 to 20 girls, and one seat and one urinal for each 25 to 30 boys."

Each closet should be in a separate compartment, provided with a door, well up from the floor. The supply pipes should, if possible, come out from the wall, not up through the floors, as the latter arrangement makes it difficult for the janitor to keep the floors clean.

Separate toilets for teachers are recommended even in small buildings. In the larger buildings, men and women teachers should have separate rest rooms, equipped with closets and lavatories. A toilet and washroom is usually installed adjoining the boiler-room for use of the janitor. In large buildings, a janitor's utility room, equipped with a slop-sink, is usually placed on each floor.

The age of students determines the size and, in some cases, the number of fixtures. A group of sanitary regulations prepared by the Public Health Council of West Virginia contains the following sentence: "All school toilets and privies shall have 5 seats for every 100 boys and 7 seats for every 100 girls and very young children."

Lavatories and Hand-Washing Facilities

The number of students to a lavatory is a matter on which codes vary. Some codes make absolutely no provisions for washing facilities. In Pittsburgh, one lavatory is required for each 50 students up to 300, and one lavatory for each additional 100 students. In the Wisconsin regulations we find: "In new installations there shall be at least one lavatory for every five fixtures (closets and urinals) or fraction." One lavatory to every two or three fixtures is, however, recommended in the code.

There is some difference of opinion as to how many students one lavatory should serve. The American Child Health Association recommends at least one lavatory to every 80 children. This is a minimum standard. The Massachusetts Institute of Technology advocates at least one lavatory to every classroom of 40 children. This figure is based upon experimental studies as to standards for industries and upon local school experience. Wood-Rowell suggest one lavatory for 50 girls or 75 boys. As a general rule, however, no distinction is made between sexes in determining the number of these fixtures which are to be installed.

Hand-washing facilities are far from adequate in many school buildings, according to a survey recently made of 404 schools in the United States and Canada, by the Metropolitan Life Insurance Company. Of the 404 buildings, only 41 per cent were definitely known to have adequate hand-washing facilities. In the remaining 59 per cent, either the facilities were unsatisfactory, or no information was furnished regarding them. This may be considered fairly representative of the more progressive school systems. Details of this study are found in "Hand-Washing Facilities in Schools," Monograph Number 3, School Health Bureau, Welfare Division, Metropolitan Life Insurance Company.

The report further showed that 215 buildings had hot and cold water available, 324 had soap for hand-washing, and 340 were supplied with towels. Of 317 schools which reported on the location of the soap and towels, this equipment was conveniently near the lavatories. In its report, the Metropolitan Life Insurance Company says: "The fact that soap and towels must be conveniently located if hand-washing facilities are to be satisfactory, is mentioned by the American Child Health Association in 'A Health Survey of 86 Cities.'"

Drinking Fountains

Many well-prepared codes have no reference to drinking fountains. In some codes, drinking fountains must be installed or students must be furnished with individual drinking cups. In Pittsburgh, one fountain is required for each 80 students. Some regulations prohibit the use of fixtures which permit the water to drop back from the mouth into the fountain. Others require the use of guards which prevent the lips from touching the outlets. In most installations, several fountains are installed over a common sink. It is important, when installing fountains, to provide a uniformly distributed water pressure. In some cases, the water may splash into a drinker's face when he turns on the faucet, while the user of another fountain may be welcomed by a negligible stream.

It is advisable to install the fountains in a readily accessible location, preferably in a public hall. It is not generally considered good practice to place them in toilet-rooms.

The Pittsburgh Board of Education fixes the following heights for drinking fountains:

Type of School	Height of Fountain Above Floor
Grade	30 inches
Junior High	36 inches
High	42 inches

The Chicago Board of Education installs fountains 26 inches high for very small children.

It is generally considered good practice to place drinking fountains in classrooms to be used as kindergartens. The students, being very young, may require some training in using these fountains, since in most cases they have had no previous experience with them.

In the foregoing, several references are made to codes. In considering them, it should be borne in mind that they deal only with minimum requirements and not with ideal standards. For this reason, the ratios they establish should not necessarily be regarded as the most desirable.

New Standards Now Being Compiled

There is a movement under way to obtain definite standards in this field. The American Public Health Association, the Cleanliness Institute, the Massachusetts Institute of Technology, the Metropolitan Life Insurance Company, and the Plumbing and Heating Industries Bureau are working on the compilation of standards for the selection, installation, and administrative use of sanitary equipment in educational buildings.

Where laboratory and recreational facilities form a part of the school, additional sanitary facilities must be provided. In general, one lavatory should be provided for each sewing or art room and two for each chemical laboratory, physics laboratory, or shop. These recommendations are based on the experience of school officials. When very large rooms are used and the number of students is increased proportionately, added washing facilities should naturally be provided.

Work Sinks for Laboratories and Domestic Science

When classes are given in domestic science, biology, physics, chemistry, shop work, etc., a series of work sinks should be installed in the laboratory rooms, in order that equipment may be washed conveniently. It is a good plan to have both hot and cold water flow through a swing spout.

The type of wastes which will be disposed of must be considered when selecting laboratory sinks and drain pipes. Wastes of a high acid content require special equipment.

The domestic science equipment should include a modern double-drainboard kitchen sink, equipped with a swing spout and an electric dishwasher. The reason for this is that the students should familiarize themselves with home mechanics and with the most up-to-date household equipment. In some home economics laboratories, water softeners and filters are installed and operated.

School lunch-rooms should be equipped with water coolers and glasses so that the students can

have drinking water with their meals. It is desirable to have washrooms near at hand, so that the students will be encouraged to wash their hands both before and after eating. The kitchen should be properly equipped with sinks for use of the cooks and dishwashers.

It is doubtful that home economics equipment is receiving the careful attention that it should in most school-building programs. There is a general feeling among school officials that too often the tendency is to spend money on exterior effects instead of putting the additional dollars into adequate and modern laboratory equipment. As one school superintendent has put it, "When our school board built the high school they spared no expense on the upper floors but skimped on the basement." The home economics department in this school happens to be in the basement. Again the question should be raised: Is the basement the correct location for the home economics department? There is a general feeling among teachers that the home economics work should be given in sunny, light and airy rooms resembling as much as possible ideal conditions in the home.

The more progressive schools employ the unit method of teaching home economics. When this method is used, one sink is provided for every two girls in a class. An arrangement of this type facilitates the use of the laboratory method of instruction.

Showers and Toilet Facilities for Gymnasiums

Every gymnasium should be equipped with shower and toilet facilities. As these facilities will be used immediately after classes by a comparatively large number of students at one time, it is important that an adequate number of fixtures be provided. The architect must determine how large the gymnasium classes will be, as well as the maximum number of students who will use the gymnasium at any one time.

In all cases where showers are installed, special care must be taken to prevent the bathers from being scalded. The safest precaution is to keep the hot-water temperature at or below 120° Fahrenheit. The next best step is to equip each shower with a thermostat mixing valve and a pressure equalizer.

Both the boys' and the girls' gymnasiums have distinct shower arrangements. It is common practice to have the boys use a central room, where several shower heads may be in simultaneous operation. One shower head should be provided for every ten boys. In girls' gymnasiums, however, each shower is usually in a separate compartment, because it has been found that girls dislike the central arrangement of showers. There are several methods of arranging girls' showers which will not be discussed here, since their applications are too specific to admit of any wide generalizations.

Students should be required to pass through a shower-room before entering a swimming tank. In some schools, the students enter the natatorium through a doorway across which water is sprayed, and walk through a foot-bath.

The swimming pool should be planned so that adequate drainage will be obtained. Both pumping and purifying equipment should have sufficient capacity to keep pure water in constant motion through the pool while it is in use. Cuspidors should be placed along the side of the pool.

First-aid rooms adjoin both gymnasiums. These are equipped with physicians' sinks. These differ from ordinary lavatories in that the water spouts are some distance above the bowl.

When Selecting Types of Equipment

As a matter of economy, fixtures should be definitely decided on before construction has begun. It is important that the decision be definite. Very often a committee will select equipment and change its mind after the preliminary piping has been installed. In such cases, it is frequently necessary to take out this piping and install new connections. This type of work results in needless expense.

In selecting fixtures, attention should be given to appearance, upkeep, and the ease with which they may be kept clean. Vitreous china and acid-resisting enamel are not subject to the stains which mar ordinary equipment. Non-tarnishing metal fixtures eliminate the necessity of frequent polishing, and always present a pleasing appearance.

In buildings of two or more stories, it is usually advisable to provide toilet facilities for both boys and girls on each floor. Some authorities believe that lavatories should be connected with each classroom, or at least with each small group of classrooms. When the toilets are located in the basement of a school building, there is a large amount of waste motion and lost time among the students. This condition can be eliminated by a little thought in arranging the toilet-rooms.

Adequate sanitary facilities are essential in the modern educational building, if the children are to be protected against the spread of disease. As the students are all in close proximity to one another, every reasonable step must be taken to prevent contagion from entering the classroom. This is best done by periodic health examinations and rigid health supervision. Work such as this, however, cannot be effective unless it is fortified by habits of cleanliness among the students themselves. Students will find little encouragement to keep clean unless they are offered satisfactory facilities for doing so. Properly installed fixtures will not only make it easy for the students to pay proper respect to sanitation; they will also instill habits of cleanliness in them that will last years after their school days are over.

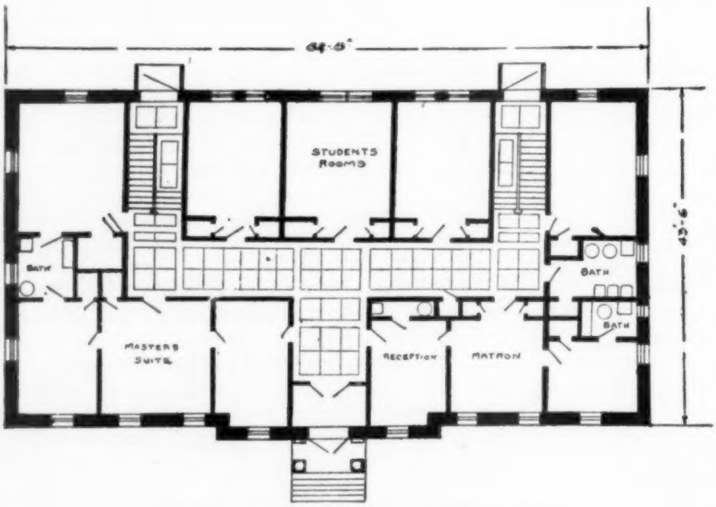
Austen Colgate Hall at Peddie

BY ROGER W. SWETLAND, LL.D.

HEADMASTER, THE PEDDIE SCHOOL, HIGHTSTOWN, N. J.

AUSTEN COLGATE HALL, a dormitory just completed at the Peddie School, Hightstown, N. J., was erected through a legacy from the late Col. Austen Colgate, Vice-President of Colgate & Company, of Jersey City, N. J., who had been for many years Chairman of the Finance Committee and Vice-President of the Peddie Board of Corporators.

The building is fireproof throughout, constructed of steel, concrete and brick, with limestone trimmings. It is designed for the use of the younger boys of the First and Second Forms, and houses forty boys, with comfortable quarters for three resident masters and a house-mother. McKim, Mead & White, of New York City, are the architects.



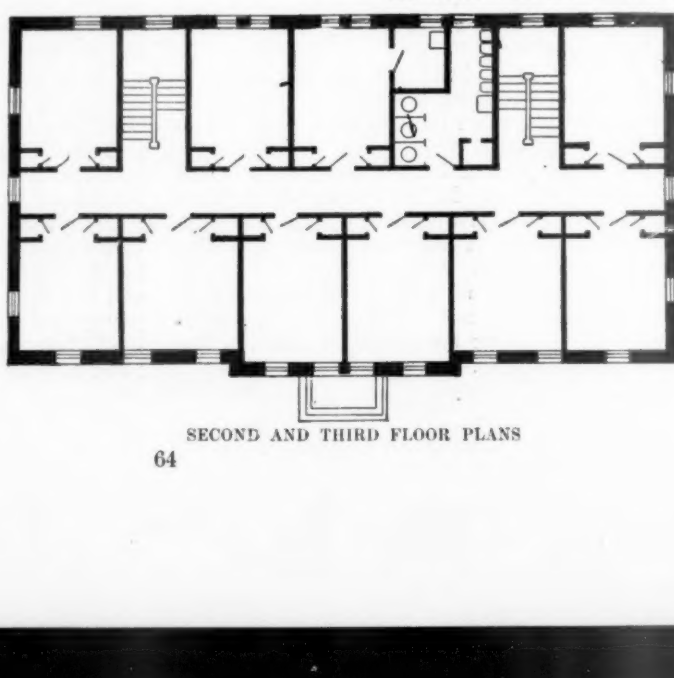
FIRST FLOOR OF AUSTEN COLGATE HALL

The accompanying floor plans show the room arrangements. Two boys occupy a room, yet each boy can feel a proprietary share in his own half of the common occupancy. The main objects are health, comfort and convenience. Ample light is furnished by an interesting arrangement of large windows, two for each room. Electric lighting is designed by experts, so that at such times as a boy studies in his room under artificial light he will work under the best possible conditions. Heating and ventilating problems have been successfully solved by skilled engineers, so that, as far as possible, each room will be supplied with comfortable heat and fresh air at all times. Commodious closets, a separate one for each boy, provide space for the orderly arrangement of clothing. A built-in bookcase over each boy's study table helps toward tidy housekeeping. In fact, in every way that forethought and experience can devise, Austen Colgate Hall provides ideal living accommodations for younger boys.

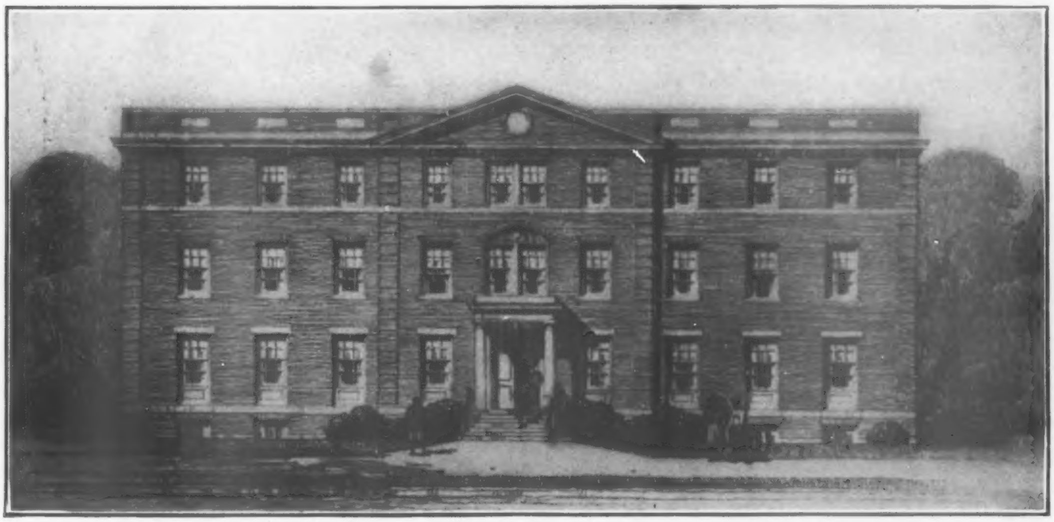
The Social Atmosphere

On the ground floor, as will be seen from the plan, are living-rooms for the resident master in charge, with a study easily accessible to boys and visitors. On the same floor are rooms for the house-mother and a reception room where the parents of boys may be received as they visit the school. The second and third floors each have quarters for a resident hall master, thus giving to boys excellent supervision as well as the advantages of intimacy in out-of-classroom relations with the men whom they also meet more formally in their scholastic work.

The basement provides storage room for trunks and the necessary mechanical features of the building. But the charm of the basement is its large lounging-room, in one end of which is a reading-table, with books and magazines suited to boy life; at the other end are tables for



SECOND AND THIRD FLOOR PLANS



AUSTEN COLGATE HALL, PEDDIE SCHOOL, HIGHTSTOWN, N. J.

quiet games, while the large central portion faces a spacious fireplace, a delightful gathering place for bedtime stories.

Shower-baths, lavatories, drinking-fountains on each floor, all in rooms of glistening tile, with every precaution for perfect sanitation, add to the comfort and convenience of one more complete dormitory unit of a rapidly growing school.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Insulation—Johns-Manville Corp.
Piping—A. M. Byers Co.
Plumbing Fixtures and Showers—J. L. Mott Co.
Valves—Crane Co.

The Administration Building for the Board of Public Education, Pittsburgh, Pa.

BY JAMES BONAR

SUPERINTENDENT OF BUILDINGS, THE BOARD OF PUBLIC EDUCATION, PITTSBURGH, PA.

THE needs of Pittsburgh's large, growing school system are being cared for by the administration building which was put into service last September. It stands in the heart of the Schenley Park district, directly opposite the Carnegie Institute on Forbes Street and the University of Pittsburgh's Cathedral of Learning on Bellefield Avenue. Forming as it does one of the group of the educational district of Pittsburgh, from an architectural as well as a utilitarian standpoint it becomes one of the featured buildings in the city.

Its formal style is in harmony with that of the other buildings in the neighborhood. It is built of steel frame with Indiana limestone, around a central court on which all the offices face, the corridor being on the street side of the structure. This arrangement insures quiet and satisfactory light.

Three of the four floors are occupied, leaving room for expansion to meet increasing needs. One of the accompanying illustrations shows the formal, dignified nature of the board room. Large committee meetings and public hearings are held in the assembly room, also illustrated. The executive and clerical forces find the heating and ventilating arrangements planned to insure the best working conditions.

The cubage of the building is 1,450,000 cubic feet, entailing a cost for the equipped building, in round numbers, of $960,000, with a land cost of $212,000.

The following firms, all of Pittsburgh, planned and constructed the building:

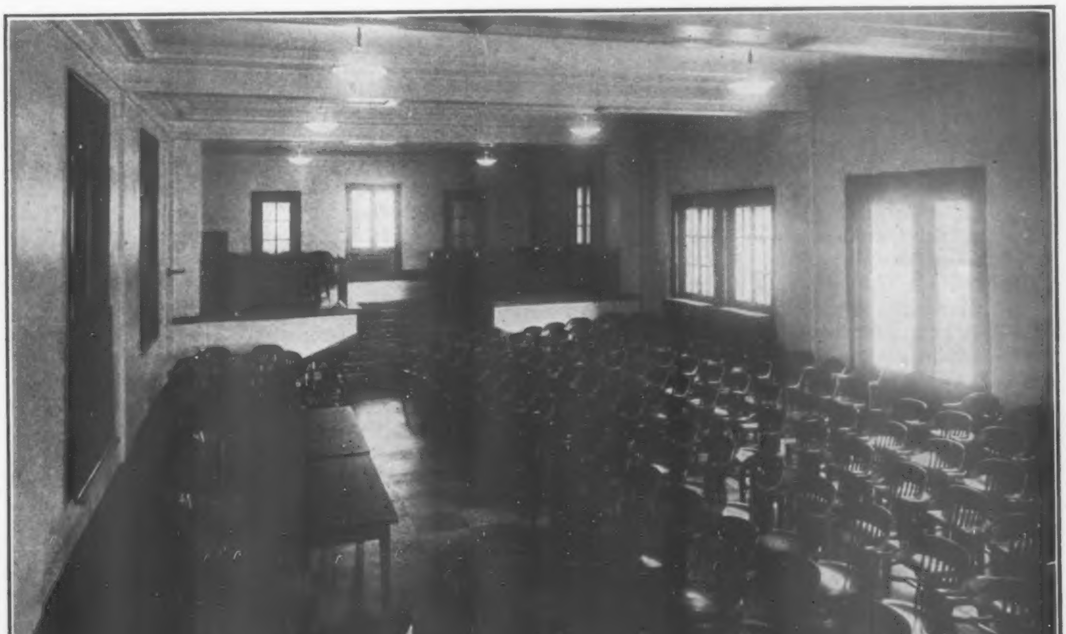
*ADMINISTRATION BUILDING, BOARD OF PUBLIC EDUCATION, PITTSBURGH, PA.

The architects were Ingham & Boyd; the consulting engineers, C. L. Wooldridge, Inc.; the general contractor was August Conradis; W. N. Sauer & Co. had the heating and ventilating contract; Leo B. Buerkle installed the plumbing; and the Lord Electric Co. was the electrical contractor. The entire undertaking was supervised by the Superintendent of Buildings, and the Building Department of the Board of Education acted as domestic engineers.

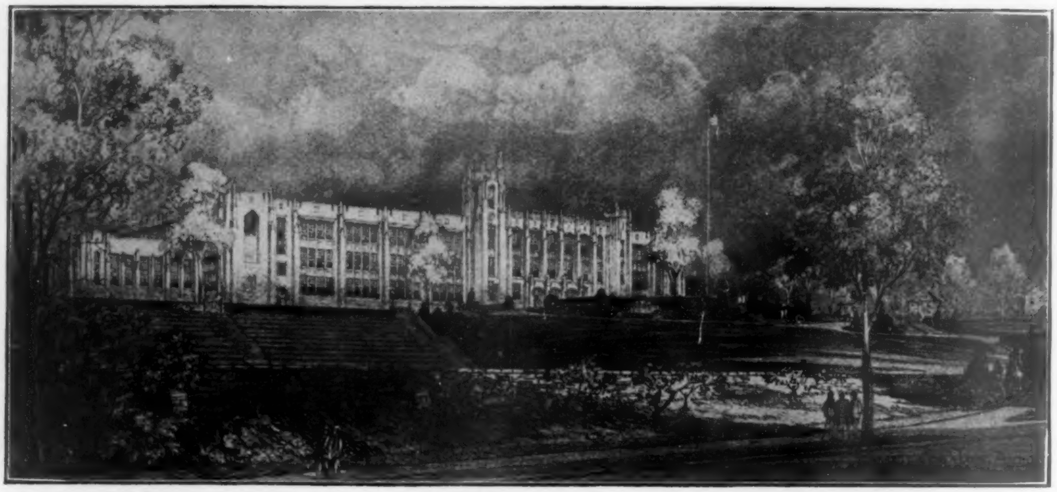
ABOVE—THE BOARD ROOM OF THE ADMINISTRATION BUILDING

AT RIGHT—OFFICE OF THE SUPERINTENDENT OF SCHOOLS

COURT OF THE ADMINISTRATION BUILDING OF THE BOARD OF PUBLIC EDUCATION, PITTSBURGH, PA.



ASSEMBLY ROOM OF THE ADMINISTRATION BUILDING



A New High School on a Seventeen-Acre Site in White Plains, N.Y.

BY N. L. ENGELHARDT

PROFESSOR OF EDUCATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

THE growth in high school population in Westchester County is well illustrated by the new construction for high school facilities for the city of White Plains. The result of a long period of planning on the part of the Board of Education, Superintendent Lumbard, Associate Superintendent Hardy, the architects, and the educational consultants of the Board, can now be visualized in the construction of the new High School nearing completion.

White Plains has secured for its High School site a hilltop of 17 acres of land, commanding a view for miles around. This property was formerly called the Mary Zinn Orphan Asylum and is located on the old Mamaroneck Road and North Hartsdale Avenue.

It has long been apparent to the citizens of White Plains that a new high school has been needed, as the old high school building is most inadequate to meet the needs of the present student body. The lack of adequate exits, the nonfireproof nature of the building, the poorly lighted classrooms in the basement and the fourth floor, the poorly placed and poorly ventilated locker and gymnasium facilities, the inadequate toilet facilities, and the almost complete lack of rooms for special purposes, are some of the features which have necessitated the abandonment of this building for school purposes. Combined with these features is the undesirable location of the school on the very borderline of the commercial area of the city.

The Board of Education has been anxious to provide a modern high school building which will meet the needs of the increased enrollment for a few years to come, as well as one which will provide most adequately as a substitute for the present quarters. Every effort has been made by the Board to plan a school building which conforms in all particulars to the desirable school-building standards which have been advanced by school authorities during the past decade or more.

For the planning of the new building, the Board of Education secured as architects Starrett and Van Vleck of New York; and as educational consultants, Professors George D. Strayer and N. L. Engelhardt of Teachers College, Columbia University.

Preliminary Survey and Subsequent Studies

The architects and the educational consultants have worked through a long series of conferences with the Board of Education and with Superintendent Lumbard and his assistants to the end that the best possible high school might be developed. The work of the planning of the building was initiated a few years ago in the form of a survey made by Drs. Strayer and Engelhardt of all of the educational needs for the city of White Plains. Out of this survey and subsequent studies, the educational consultants prepared a statement of building needs giving in detail all the room requirements to conform to the curriculum which was being developed.

After this preliminary statement of need for high school facilities was developed, the educational consultants and the administrative staff of the school system worked in conjunction with the

architects in the development of the plans for the building. These conferences brought about a review of the plans with respect to the size and placement of classrooms in relation to the particular purposes for which they are to be used, the general arrangement and space relationships for all other facilities to be provided in the school building, the standards which have proved most acceptable for laboratories, lecture rooms, study halls, gymnasiums, auditoriums, and all other special rooms. In these conferences the educational consultants and the architects also analyzed the plans with respect to artificial and natural lighting, heating, ventilation, sanitary equipment, and the like, for the purpose of conforming to the best practices.

After a series of revisions, the preliminary plans reached the stage where plans were ready for submission to the Board of Education. The approval of the Board and the Common Council, and the voting of the appropriation of $1,500,000, made it possible for the architects to proceed with their working drawings and the conclusion of the project from the architectural standpoint.

Arrangement of the Different Floors

The point selected for the location of the school has been the high plateau on the site selected. The architecture is collegiate Gothic. No rooms have been planned in the basement of this building except as the contours permit such rooms to be fully out of ground and to be as adequately lighted as any classrooms in the upper stories of the building. Because of the rolling nature of the terrain, it has been found possible to utilize in part a basement which conforms to this lighting requirement.

On the first floor of the building will be found the auditorium with a seating capacity of 1,500, the offices of administration and health education, eight classrooms, a music room, a public speaking room, the girls' gymnasium, a cafeteria and kitchen, mechanical drafting room, student activities' room, and accommodations for the men and women teachers of the building. The locker facilities for the boys' gymnasium, shower-room and handball and director of gymnasium will also be found on this floor.

On the second floor have been placed the library and two study halls, fifteen classrooms, biology, physics and chemistry laboratories, and the balcony of the auditorium. Above the locker facilities for boys has been placed the boys' gymnasium, with a playing floor of 50 feet by 94 feet and with spectators' seats for those who attend the school games.

On the third floor are found seventeen classrooms, the bookkeeping and typewriting rooms for the commercial work, two art or drawing rooms, the cooking and sewing rooms, and a science laboratory.

On the basement floor, the locker rooms and showers for the girls attending the gymnasium classes have been so placed that the rooms are fully as well lighted as any other rooms in the building. Workshops for boys, including an automobile shop, a woodworking shop and an electrical shop are also to be found here. There have also been located in the basement certain storerooms and service rooms needed in conjunction with the heating, ventilating and maintenance and operation of the plant.

Administrative Offices, Cafeteria, Locker Rooms, etc.

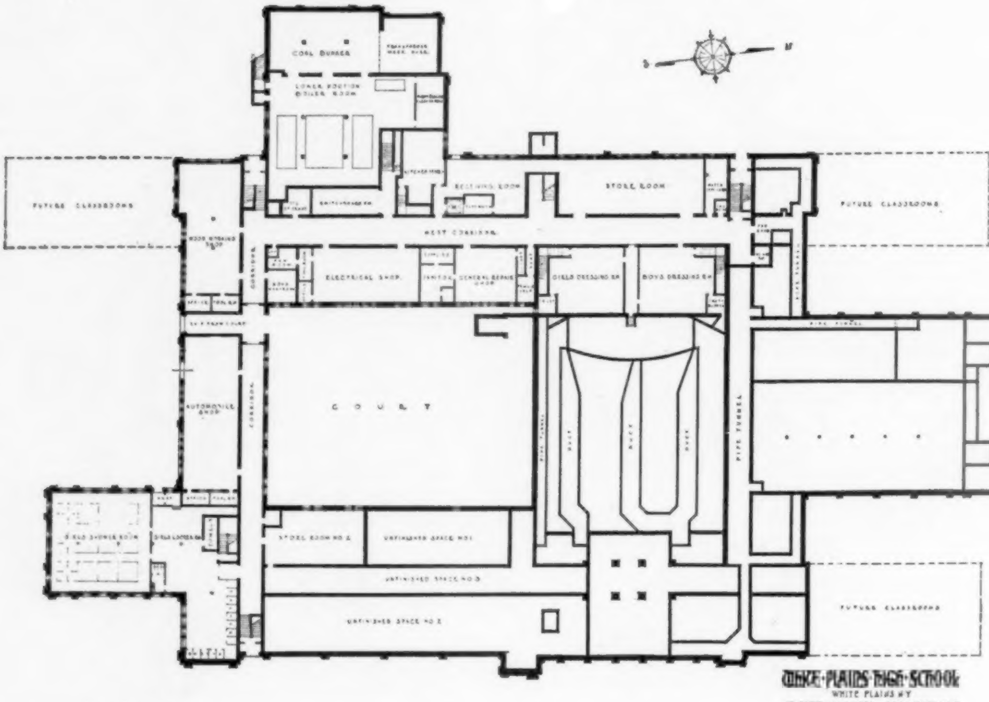
The administrative offices have been located to the right of the main entrance, which is also the main entrance to the auditorium. These offices are readily available to the public as well as to the student body. They have been arranged to provide for a maximum of efficiency of administration. The time of teachers, pupils, and the public will be conserved in their contacts with the school organization because of the plan which has been developed. To the left of the main entrance will be found the health educational classroom and health service rooms. These rooms provide adequately for the physical inspection of children, the giving of eye and ear tests, class work in health education, and rest rooms for girls. Locker alcoves have been placed on each floor of the school, so that every child will be provided with a locker readily accessible to his home room. Toilet facilities are to be found on each floor. Each toilet-room is well provided with windows so that it will get a maximum of daylight and sunlight.

The cafeteria, located on the first floor, has been planned to take care of all of the enrollment of the building through a luncheon program of three shifts. Special care has been taken to route large groups through the cafeteria with a minimum of congestion. The cafeteria has been so located to the rear of the first floor that cooking and food odors will not penetrate throughout the building.

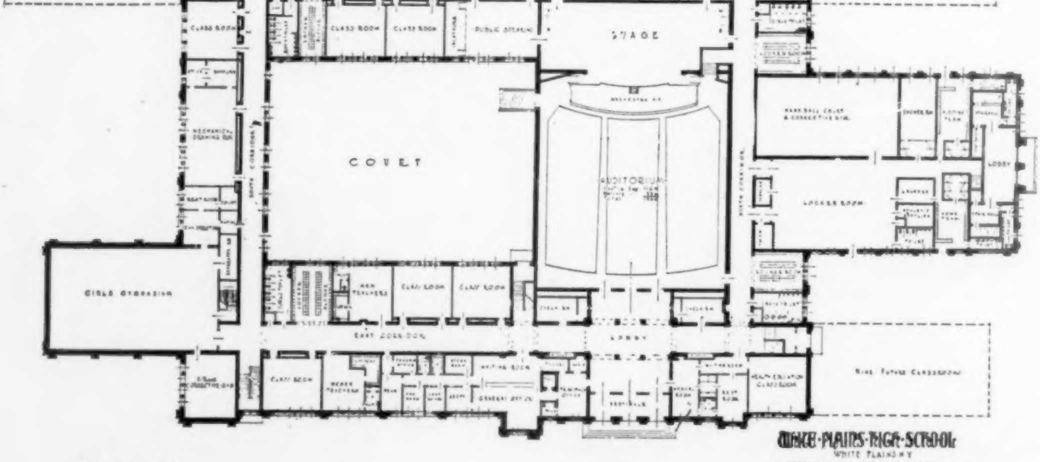
The tendency in the past has been to place locker-room facilities for the physical education department in the basement away from the light and in rooms which are difficult to ventilate. These errors have been obviated in the present planning. Both the boys' and girls' lockers are on grade level with the gymnasiums directly above. This will make fresh air and sunlight available to all of the spaces which are provided for health education.

Library and Study Halls

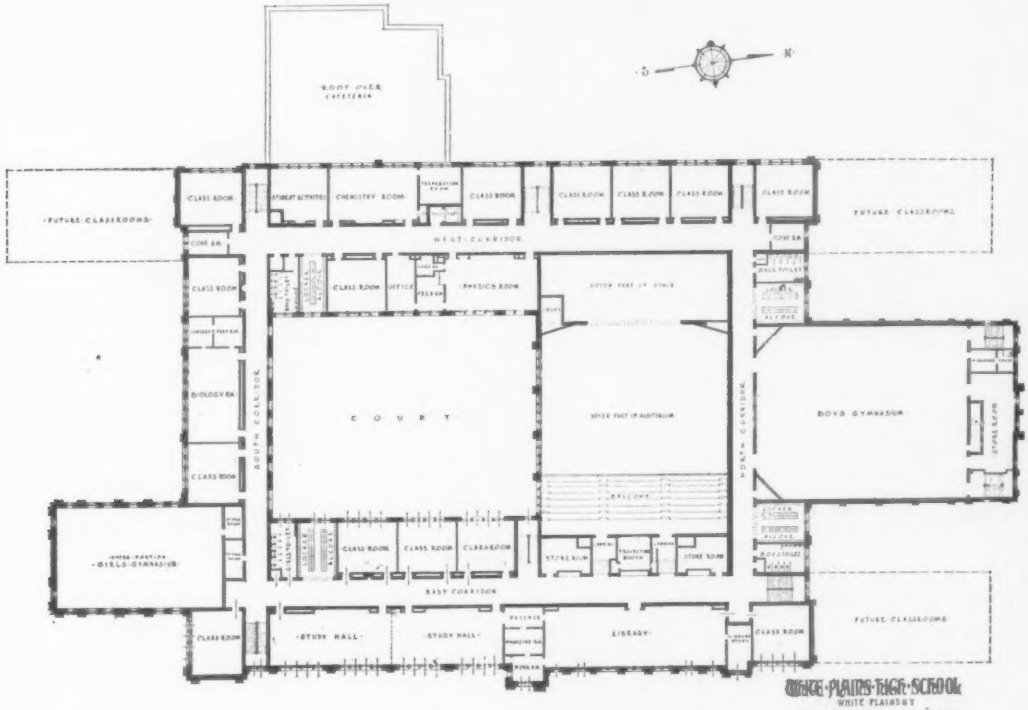
A high school building is best administered when its classrooms, laboratories and other special educational rooms are planned about a library and study halls which are centrally located. The study halls in this building are located on the second floor front. The library is the central feature of this grouping, with a study hall on either side. The classrooms have been made of a standard size, 23 feet wide and 26 feet deep. They are all planned so that an entrance and an exit door provide for rapid passing of students. They are so lighted that no student nor teacher will face



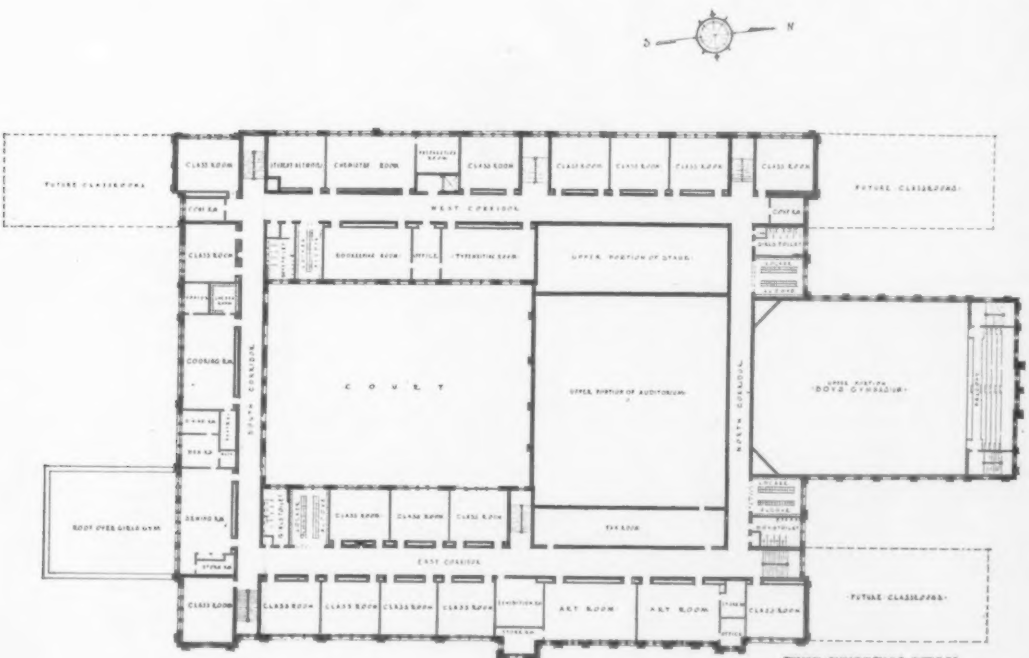
BASEMENT PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN

the light, nor will any child have confusing shadows thrown across his working desk. Classes of thirty-five students will be conveniently housed.

Provisions for Safety

The building will be of fire-resistive construction throughout. Additional precautions for the safety of children have, however, been taken in the planning of the travel routes throughout the building. A study of the corridors, stairways and exits of this school building will lead to the conclusion that the arrangement provides for the greatest ease in the circulation of large groups throughout the building and in emptying the building of students in case of fire danger with a minimum loss of time. All stairways are located where they are readily accessible and have been planned with smokeproof and fireproof doors so that students entering upon them will be assured of the utmost safety. Passageways leading directly out-of-doors are planned from the first, second and third floors, so that through this means the students will find it possible to leave the building very rapidly if necessity should require.

Seven Important Purposes of Secondary Education

A modern high school building must be planned to provide facilities which will make possible the realization of the major purposes of secondary education. The old type of building which was made up primarily of classrooms is entirely inadequate. Among the more important purposes of secondary education are the following:

1. *Health.*—During the period of secondary education, it is of the utmost importance that health habits be acquired and that health instruction be given. Not only in the program of play in the gymnasium and on the athletic field, but in every part of the work of the school, the consideration of health is of primary importance. It is essential that adequate equipment for physical activities be provided and that the school building, its rooms and its surroundings conform to the best standards of hygiene and sanitation.

2. *The Command of Fundamental Processes.*—We ordinarily think of the fundamentals as acquired during the elementary school period. This is not the case for those who are to go on to higher education or to accept the larger responsibilities associated with the completion of a high school course. Facilities in library and laboratory are necessary for the development of the larger command of the mother tongue and of the tools of inquiry.

3. *Worthy Home Membership.*—We no longer think of the school as unrelated to the home. The modern secondary school is concerned with helping children to participate more actively and intelligently in the work of their homes and in preparing them for their later vocation as home-makers. Most of the girls who attend high school will have as their primary vocation home-making. It is essential that work in the household arts, including the selection and preparation of food, the selection of materials and the making of clothing, home decoration, and a consideration of the economic problems of the home be taught during the high school period. Special facilities in the home economics laboratories and in science laboratories are required for this part of the course.

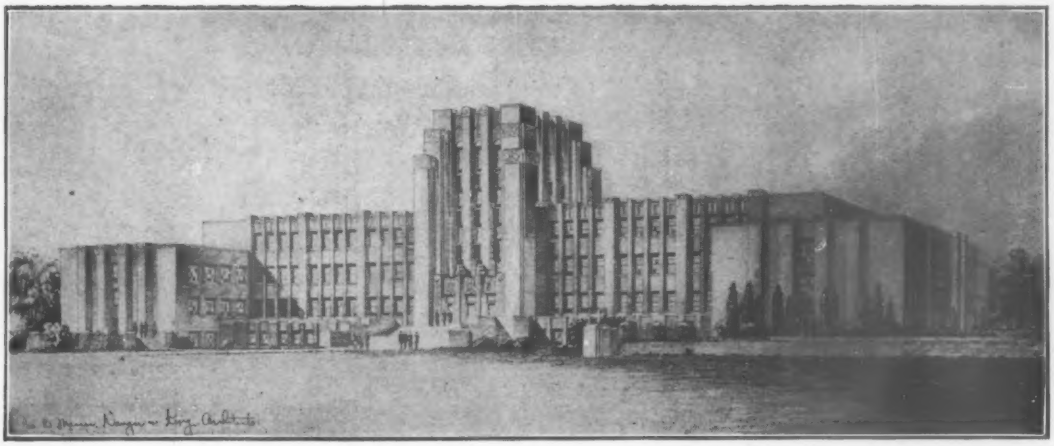
4. *The Choice of a Vocation.*—The period of secondary education is the one in which it is desirable that boys and girls choose their life vocation. If this is to be accomplished, the school must present a variety of courses and acquaintance with the major activities that are carried on in the world. Work in the fine arts, in the industrial arts, in commercial subjects, as well as in the traditional academic subjects, is required as a foundation upon which to make choices. These opportunities, together with the presentation by leaders in their several fields of the many vocations that are open to boys and girls, are found in all modern high schools.

5. *Civic Education.*—Boys and girls can learn to take their share of responsibility in the community, in the state, and in the nation only upon the basis of the responsibilities which they have accepted during their school life. The best preparation for later citizenship is the practice of citizenship in the school. In our modern secondary schools, opportunities in school and class organizations, in the publication of school papers, in debate, in participation in various clubs, furnish the necessary foundation for the work to be undertaken by the good citizen after he has left high school.

6. *Worthy Use of Leisure.*—Secondary education should provide every boy and every girl with the ability to secure from leisure the recreation of body, mind and spirit, and the enrichment and enlargement of his or her personality. If these desired ends are to be secured, the school must utilize the means of enjoyment, such as music, art, literature, drama and social intercourse. The room provided for music and art, and the stage provided in connection with the auditorium, are as essential as Latin or mathematics classrooms.

7. *Ethical Culture.*—Growing out of all the many activities carried on in the secondary school, we seek to develop sound character. We no longer believe that it is possible to achieve this result by teaching precepts. Character is developed only upon the basis of activity. To participate in the life and activity of the modern secondary school, to accept responsibility for the work that is there carried on, is the only sound basis for the development of character upon the part of the boys and girls who attend the school. Ideals presented in literature, in history, in science and in art become vital as children work out their concept of these ideals in their work.

The building designed for White Plains is one in which this modern program of education can be undertaken to best advantage. It is in no way extravagant, and yet it offers the necessary facilities for the accomplishment of the purposes acknowledged by all who are acquainted with the problems of secondary education.



The North Little Rock High School

BY MANN, WANGER & KING

ARCHITECTS, LITTLE ROCK, ARK.

A SCHOOL BUILDING in the modern style is under construction in North Little Rock, Ark. The structure is of gray brick and stone and is situated on the highest point in the city. The building is three stories, with basement, and the principal entrance is surmounted by a five-story tower. Entrance is gained by a broad flight of steps leading into a spacious lobby, finished with rough sawed Kasota stone. Directly to the rear of the lobby is an auditorium seating 2,000 persons, with a proscenium arch 90 feet wide. The gymnasium is located on the auditorium stage, and the points of sight are so arranged that a basketball game is visible from all parts of the auditorium.

The basement contains the vocational departments, including automobile mechanics, machine shop, manual training, electric shop, printing-shop and music room, each department having its individual storage facilities and wash-rooms. A large cafeteria, kitchen, boiler room and toilet facilities are also provided in the basement.

The first floor contains general office, principal's office, board room, emergency room, rest rooms, toilet rooms and thirteen classrooms. The typical classroom is 20 feet by 24 feet with a 10 feet 6 inches high ceiling. This size classroom has been recommended by the Arkansas Department of Education.

The second floor contains a large library, chemistry laboratory, physics laboratory and lecture room, study halls, classrooms, club-rooms, teachers' rooms and toilets.

The third floor contains botany, biology and zoology laboratory and lecture rooms, sewing-rooms, domestic science, classrooms, teachers' rooms and toilets.

The home economics department is located in the fourth floor of the tower. The fifth floor of the tower at present is unfinished and in the future will be used as a band room.

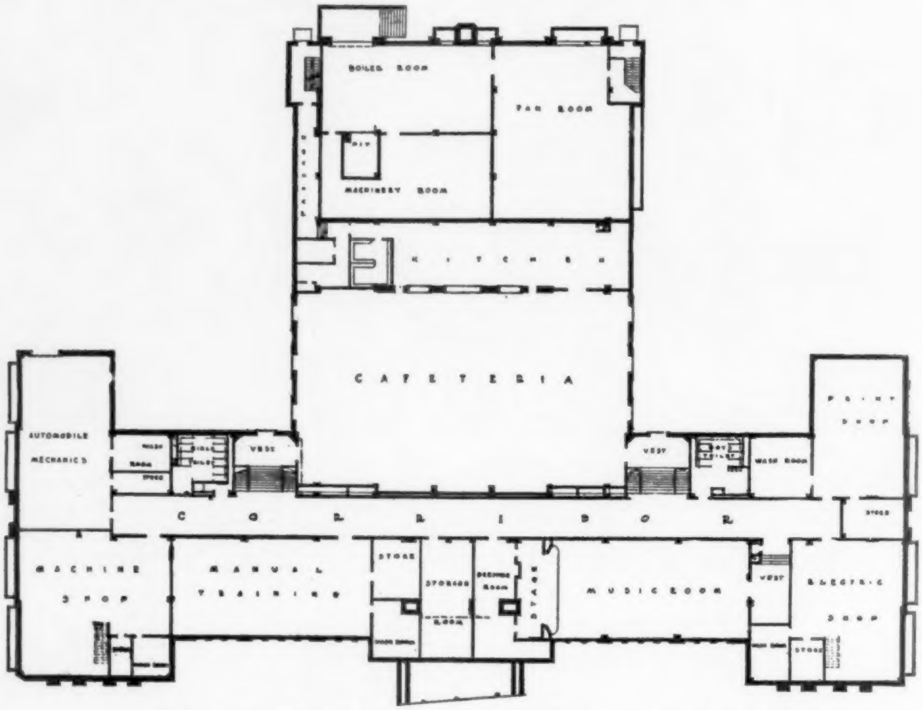
The building is constructed of reinforced concrete and steel throughout and is fireproof. The corridor and toilet-room floors are of terrazzo. The classroom and auditorium floors are of oak blocks applied directly to the concrete slabs. The auditorium is mechanically heated and ventilated. Heating in other parts of the building is accomplished by direct radiation. The building is equipped with a fire-alarm system, clock and program bell system, and intercommunicating telephone system.

The building is so designed as to permit the addition of two future units, arranged in such a manner that the first unit as illustrated in the accompanying cuts will present itself as a complete building, with a capacity of 2,000 pupils.

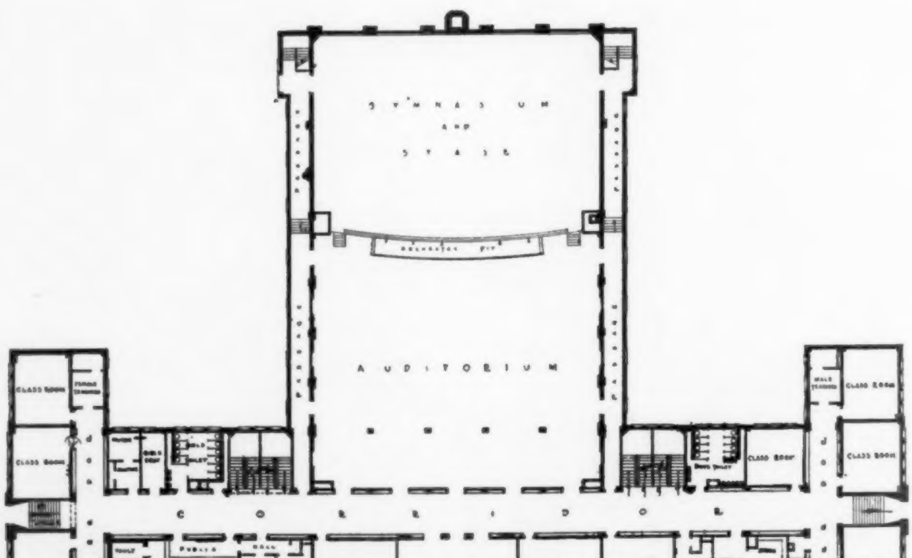
The total cost, including mechanical equipment, of the first unit, is $450,000, averaging 22 cents per cubic foot.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

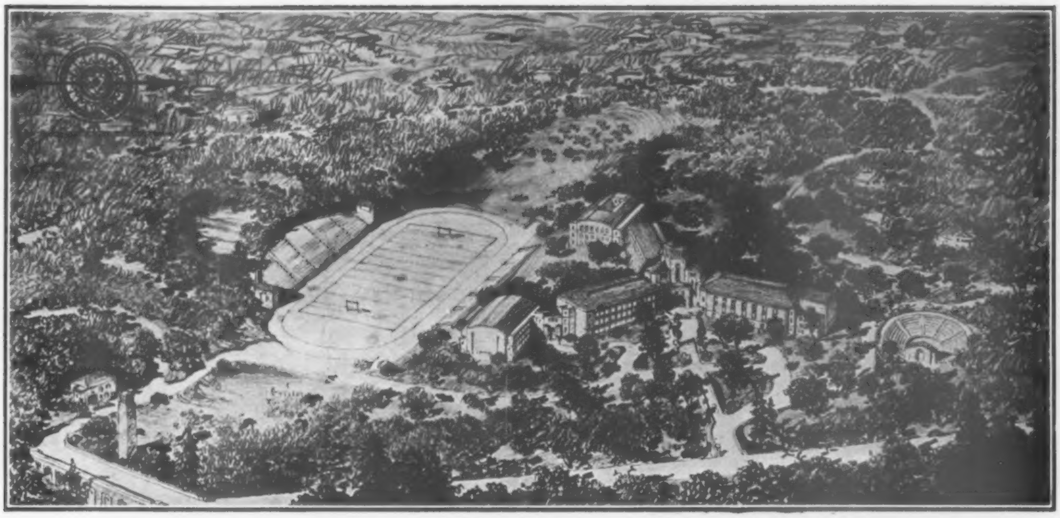
Blackboards—Weber Costello Co.
Boilers—Kewanee Boiler Co.
Clocks and Signal Systems—The Standard Electric Time Co.
Drinking Fountains and Plumbing Fixtures—N. O. Nelson Co.
Flooring—E. L. Bruce Co.
Heat Regulating System—Johnson Service Co.
Insulation—Armstrong Cork Co.
Lockers—Lyon Metal Products Co.
Piping—A. M. Byers Co.
Ventilating System—American Blower Corp.
Windows and Sash—Truscon Steel Co.



BASEMENT FLOOR PLAN OF THE NORTH LITTLE ROCK HIGH SCHOOL



PLAN OF THE FIRST FLOOR OF THE SCHOOL



THE ULTIMATE PLAN OF THE ASHEVILLE SENIOR HIGH SCHOOL INCLUDES THE STADIUM (LEFT) AND THE OPEN-AIR THEATER (RIGHT)

The heating plant which forms a bridge across the ravine is visible in the left foreground

Asheville's New Senior High School and Its 46-Acre Site

BY JOHN D. TOPPING

THE dedication, in Asheville, N. C., on February 5, 1929, of the new Senior High School which has just been completed and equipped at a total cost of $1,000,000, marked the crowning achievement of an ambitious educational building program in a progressive city whose school system already enjoyed an exceptionally high rating in a state noted for its public education facilities. Embodying in its make-up and arrangement the latest ideas in educational building practice, and in its architecture and external appearance a notable example of the architect's skill in fitting a structure to its background and surroundings, the school now stands as one of the finest public school buildings in America.

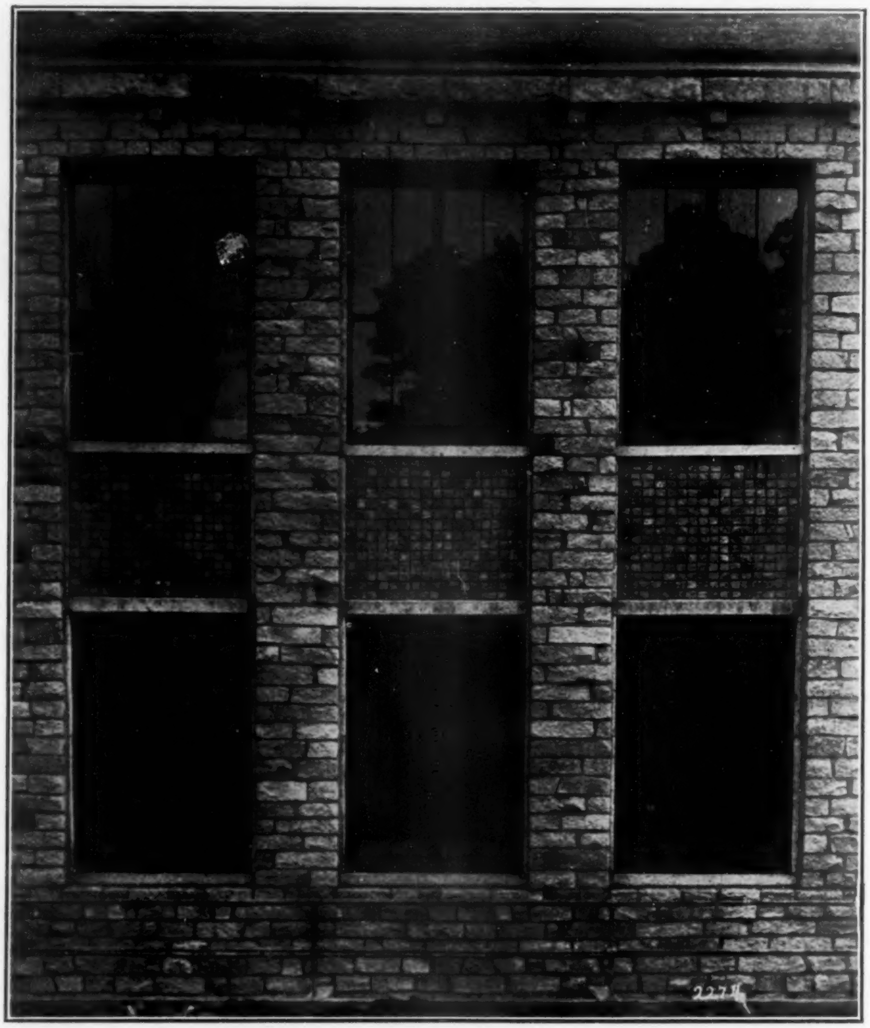
The Asheville Senior High School building was designed to take care of present necessities and to provide a basis for expansion to care for future needs of the city school system. When the School Board considered plans for the structure, they were faced with an unusual problem. In the eight years from 1920 to 1928 the public school enrollment had increased 106 per cent. The number of teachers had correspondingly increased 103 per cent. Seeking the answer to the problem of rapid increase in the demand for equipment, the Board conferred with Dr. N. L. Engelhardt, of Teachers College, Columbia University, and Douglas D. Ellington, prominent Asheville architect. The result of that conference is the present building, the first unit of an expanding higher educational system.

An Ideal Setting

A tract 46 acres in extent, fronting on McDowell Street in Asheville, was chosen as the site for the school. Two low hills with a ravine between on this tract furnished an ideal setting, with sufficient room for expansion. On one of these hills the Senior High School has been constructed. Directly across the ravine is the site of the future Junior College building, and the ravine itself will furnish a natural setting for a stadium. A natural amphitheater will also be utilized in the plans in the construction of an outdoor theater.

The architect was not hampered by man-made surroundings in the design of the building. The completed building does not follow any set type of design. In appearance it conforms to the rounded outlines of the western North Carolina mountains. Simplicity and beauty are the paramount impressions gained by the casual observer. A central tower rears itself above a rotunda which occupies the highest point on the hill. From this rotunda the wings of the building reach out in three directions like the spokes of a wheel. Scattered over the slopes of the hill are trees of the original forest, which will be preserved for nature study purposes and for landscaping.

A native North Carolina stone, Salisbury granite, was chosen as the material for the building. The range of colors from white through pink to dark gray in this granite produces a very pleasing effect. A unique and effective design of the heating plant and its smokestack have been incorporated into the general plan, the heating-plant structure forming a bridge which will eventually become the main entrance to the Junior College and athletic field. The smokestack has been built to conform to the general architectural lines of the school building and resembles a monument rather than a purely utilitarian structure.



DETAIL OF STONE STRUCTURE BETWEEN WINDOWS OF THE NEW ASHEVILLE SENIOR HIGH SCHOOL BUILDING

The masonry between the openings is of ordinary paving blocks of the same granite used in random shapes for the main surfaces and constitutes an original and effective detail

Location of Rooms and Their Capacity

The school building itself has been designed to care for 1,500 pupils in its 59 rooms. The auditorium capacity is 1,800. The central rotunda structure furnishes space for the rooms of the music department. A large room for bands and orchestras and three smaller studios are provided.

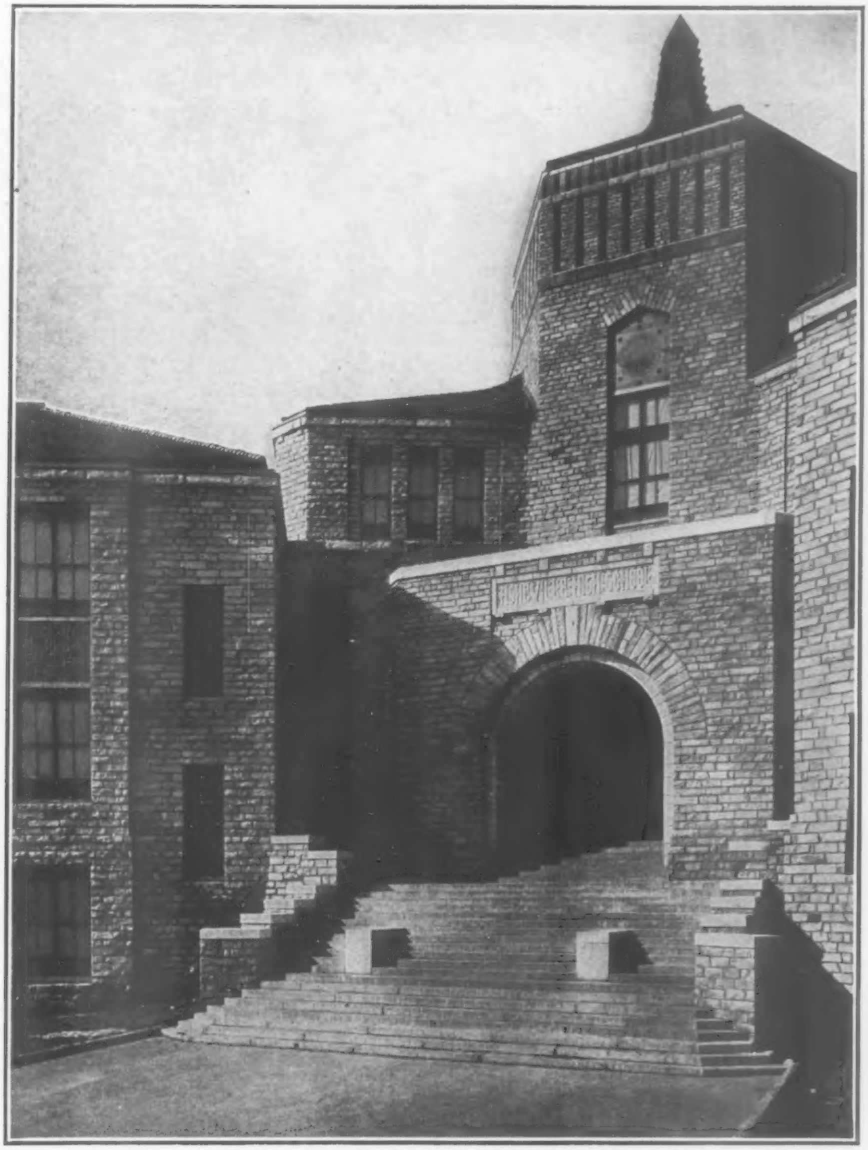
The three wings of the building provide space, in one, for the auditorium and cafeteria, and in the other two for the academic departments. Vocational laboratories, gymnasiums and workshops are located at the ends of the academic wings. The auditorium is equipped with a complete stage and all facilities for dramatic presentations.

The rotunda houses the administrative offices on its main floor. In the manual arts building, located at the end of one of the academic wings, are classrooms and laboratories for instruction in printing, electrical science, metal and woodworking, chemical and physical laboratories and the

mechanical shops. Two gymnasiums are a part of the other academic wing. The gymnasium for boys has seating capacity in a gallery for 1,200 spectators. Dressing-rooms, lockers, showers and reception rooms for visiting players are provided. Between the Senior High School and the Junior College will be located the athletic field, which will provide space for practice and interscholastic games.

The wings of the building may be expanded by the construction of additional wings at their ends. The building design provides the greatest possible amount of light in the various rooms, and the structure is absolutely fireproof throughout. The building was constructed at the rate of 32 cents per cubic foot. It is believed that this is a record low construction cost.

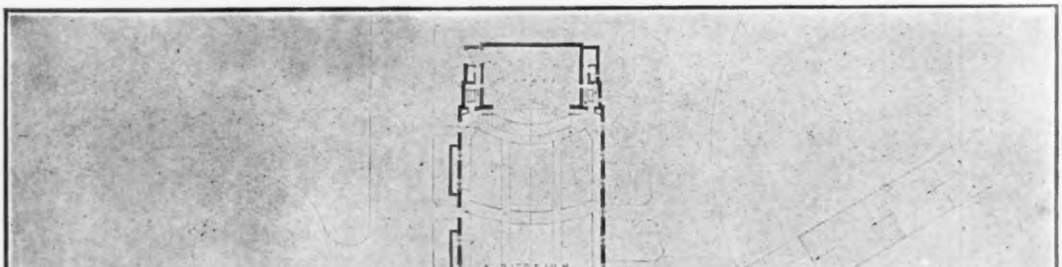
The interior walls have been decorated in a pleasing and durable gray, and the floors in the corridors are of terrazzo, while those in the classrooms are of maple. A down-feed heating system, with the feed pipes passing over vent ducts in the attic area, creates an efficient and continuous gravity ventilation system. Over 2,000 lockers



A NEAR VIEW OF THE MAIN ENTRANCE TO THE SCHOOL

The tower has been appropriately decorated with bands of colored tile to furnish contrast with the granite of the building

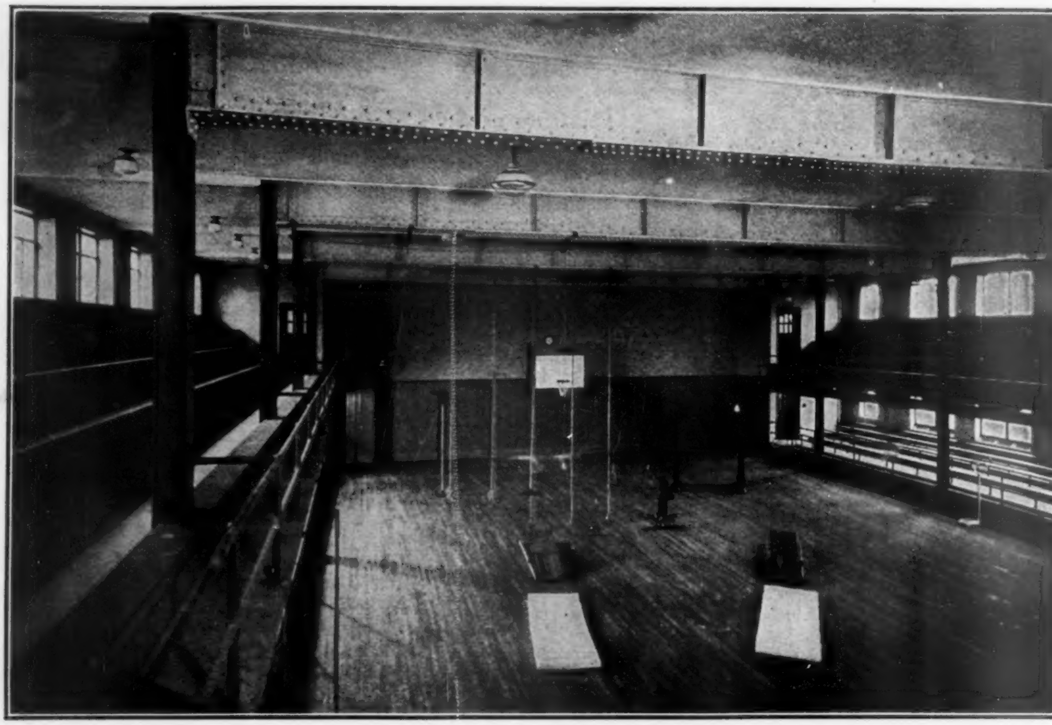
VIEW OF THE FRONT OR EASTERN ELEVATION
The central tower is a striking feature of the architecture



MAIN FLOOR PLAN, ASHEVILLE SENIOR HIGH SCHOOL

VIEW OF THE MAIN AUDITORIUM OF THE SCHOOL
The seating capacity of this room is 1,800. A stage fully equipped and lighted for dramatic presentations has been provided

CENTRAL ROTUNDA OF THE SCHOOL AND A VISTA OF ONE OF THE LONG CORRIDORS WHICH LEAD TO THE VARIOUS ROOMS IN THE THREE WINGS OF THE BUILDING
The interior decorations are distinctive and attractive



THE INTERIOR OF THE BOYS' GYMNASIUM
The seating capacity for spectators is 1,200

have been installed in the building for use of the pupils.

The building, with its large classrooms and the opportunity it offers for additional building, amply provides for the present and future needs of Asheville's fine educational system. The Asheville high schools have been accredited by the Southern Association of Colleges since 1913. The Junior College will be accredited by that Association, since it will be operated in connection with an accredited system of high schools.

During the last eight years, the School Board of Asheville has expended more than $2,600,000 in erecting nine new buildings, including the Senior High School, and in making additions to the older plants, which has added to the school equipment a total of 372 classrooms. The present expansion program, begun in 1921, will be completed when the new Junior College plant is provided. To date, the expansion represents an increase, since 1921, of 195 per cent in the number of classrooms.

In the establishment of the new $1,000,000 plant, credit is due the city government officials, the architect, Douglas D. Ellington, and his advisor, Dr. Engelhardt; the builder, The Palmer-Spivey Construction Company, the City School Board, and W. L. Brooker, Superintendent of City Schools. The project was started during the administration of Mayor John H. Cathey. It was carried to completion by Mayor Gallatin Roberts and his associate Commissioners, L. B. Rogers, and C. H. Bartlett. Members of the School Board include: Mrs. Eugene Gudger, Mrs. E. B. Sullivan, Mrs. H. A. Wells, W. Vance Brown, R. H. McDuffie, William M. Smathers, and C. G. Worley.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Acoustal Treatment—U. S. Gypsum Co.
Art, Laboratory and Shop Equipment—Southern Desk Co.
Auditorium Seats—General Seating Co.
Blackboards—Structural Slate Co.
Boilers—Oil City Boiler Works
Cafeteria Equipment—The Albert Pick-Barth Companies
Cleaning Equipment—Spencer Turbine Co.
Clocks and Signal Systems—International Time Recording Co.
Drinking Fountains—Standard Sanitary Mfg. Co.
Fire-Alarms—The Gamewell Co.
Flooring—Indiana Flooring Co.
Gymnasium Equipment and Furniture—Fred Medart Mfg. Co.
Heat Regulating System—Johnson Service Co.
Homecraft Shop Equipment—E. H. Sheldon & Co.
Insulation—Johns-Manville Corp.
Library Equipment—Southern Desk Co.
Lockers—Lyon Metal Products Co.
Office Equipment—Globe-Wernicke Co.
Plumbing Fixtures—Trenton Potteries Co. and Standard Sanitary Mfg. Co.
Print Shop Equipment—American Type Founders Co.
Roofing—Ludowici-Celadon Co.
Showers—Hajoca Corp.
Windows and Sash—Truscon Steel Co.
Window Shades—The Columbia Mills, Inc.
Woodworking Equipment—J. A. Fay and Egan Co.

Planning School Buildings for Flexibility in Use

BY A. R. SHIGLEY

EDUCATIONAL ENGINEER, WARREN S. HOLMES COMPANY, ARCHITECTS, LANSING, MICH., AND CHICAGO, ILL.

ONE of the problems which every school architect should meet is that of planning the construction of his building to meet future changes in school growth and in the school program. Nearly every community has outgrown its school buildings of twenty-five years ago; at any rate, they do not fit the school program of today. In many small communities which years ago housed their high school and grades under one roof, population growth now demands either new buildings or additions. In either case, the old buildings, with their walls, floors, and roofs ordinarily in good shape, should, in the interests of sensible economy, be made over into strictly junior or senior high schools or grade departments. Almost without exception, these new uses make changes in the plans most desirable.

In most cases the original plans contemplated no such possibility, and only rarely is it possible to change a partition without meeting serious structural obstacles. Either the building must remain unfitted to its new duties, or the board of education must pay, and pay generously, for the carelessness and lack of forethought on the part of the original planners in not providing for these changes in plan.

It would appear that every effort should be made today to prevent a recurrence of this condition twenty-five years hence, but, unfortunately, in most cases it is not being done. In some of our most forward-looking cities, buildings only two or three years old, models of beauty and of workmanship, the pride of the community, are fixed with unyielding groups of schoolrooms, forever to remain exactly in size and arrangement as the architect planned. This is one of the serious blunders actually being made in present-day school construction. It materially shortens both the life and the usefulness of school buildings and is being made because architects, for the most part, have not worked out flexible plans.

Flexibility consists of provision in plan and construction for making these changes easily and at small cost. It can be accomplished only by organizing in a systematic way the fundamentals in school planning. The building must be built up with the idea of flexibility and not just permitted to happen.

The system employed in the new schools at New Britain, Conn., has been planned from the ground up to meet the emergency that future demands are apt to make. It is flexible. No change of purpose in future administrations is hampered by air ducts, lighting arrangements or plumbing. No progressive administration becomes housebound in this type of building.

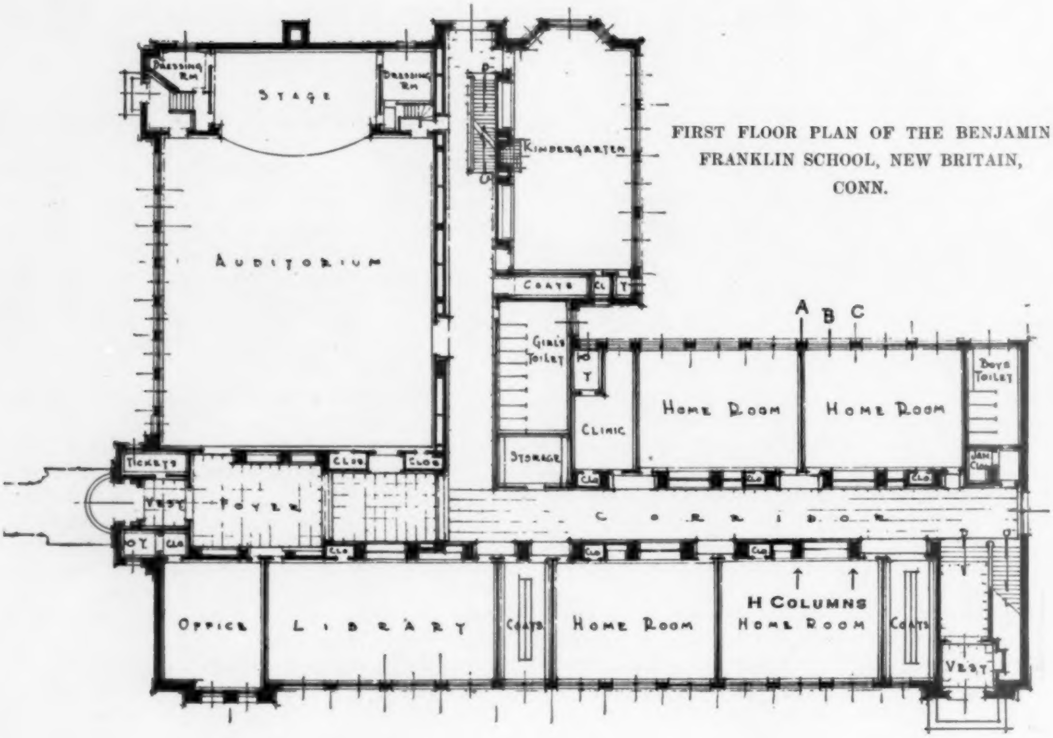
The partitions located at "A" may be moved to "B," a distance of 5 feet 0 inches, where the H-column is located exactly opposite the window mullion, or it may be moved to "C," a distance of 10 feet 0 inches, where it would occupy a position corresponding to its original location. Careful preliminary planning of the ventilating inlet and outlet air ducts, electric switches, windows, door recesses and wall cases are not in any way interfered with in such changes. In fact, the partition might be moved to any position in the building at 5 feet 0 inches intervals without disturbing the arrangement.

To secure a really flexible building, one that in twenty-five years can be at minimum expense changed to meet the demands that the next quarter of a century will develop, means more than simply relieving the partitions from carrying loads. The pipes, ducts, and supports must be kept out of the partitions. In the New Britain building these are all cared for in the H-columns along corridor walls.

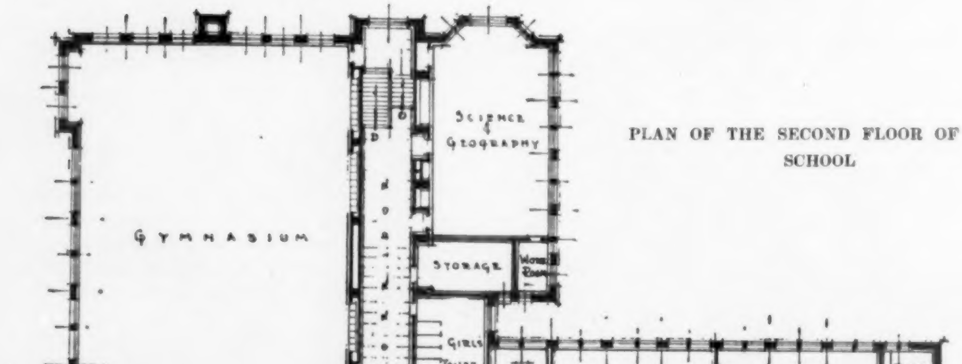
The problem actually begins to be serious when one considers that a building, in order to be flexible, must provide for a multiplicity of possible changes and still maintain proper balance in heating, ventilating, lighting and door locations.

Schools built with wardrobes at the ends of the rooms; with ventilating ducts, pipes or supports in partitions; with a random spacing of windows, and doors and ventilating flues in the corridors, are not flexible. Partitions would interfere with these features in any place except where they are. To move them would mean moving coat-rooms, rearranging the ventilating system, interfering with the natural or artificial light, blocking up doors and, in most cases, throwing out of balance the ventilating and heating plan and symmetry of the rooms.

The thoughtful planning of the building illustrated secures a flexible building capable of meeting the expansion of a growing community and a changing educational demand. Flexibility in school buildings has become of prime importance.



FIRST FLOOR PLAN OF THE BENJAMIN FRANKLIN SCHOOL, NEW BRITAIN, CONN.



PLAN OF THE SECOND FLOOR OF THE SCHOOL

HOME ROOM, BENJAMIN FRANKLIN SCHOOL, NEW BRITAIN

Showing typical wall between classroom and corridor so constructed that changes in room sizes can be made by simply shifting the position of the end wall of room and the case in the corridor walls

LIBRARY, BENJAMIN FRANKLIN SCHOOL, NEW BRITAIN

View of library comprising three 10-foot units, as indicated by the windows. This room may be enlarged or decreased in size by shifting the end position wall. No changes will be required in lighting, heating and ventilating or structural features

Six New Elementary School Buildings for the Houston Independent School District

BY HARRY D. PAYNE, A.I.A.

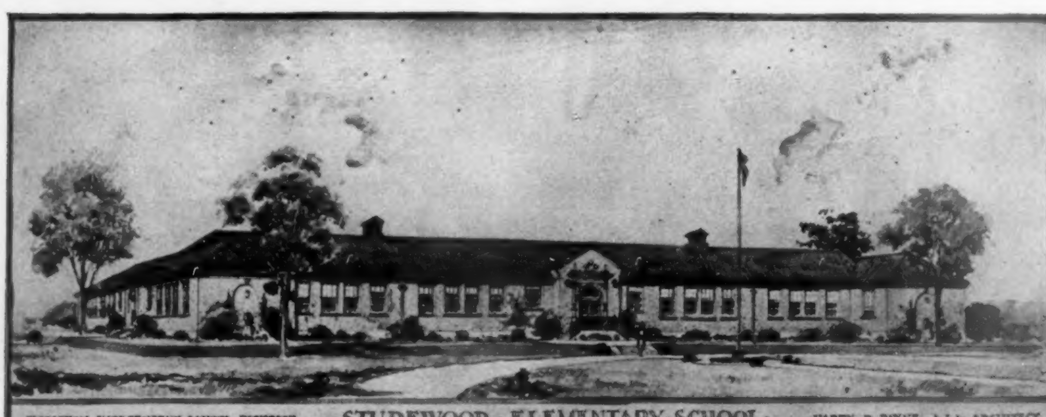
CHAIRMAN, COMMITTEE ON SCHOOL BUILDINGS, AMERICAN INSTITUTE OF ARCHITECTS

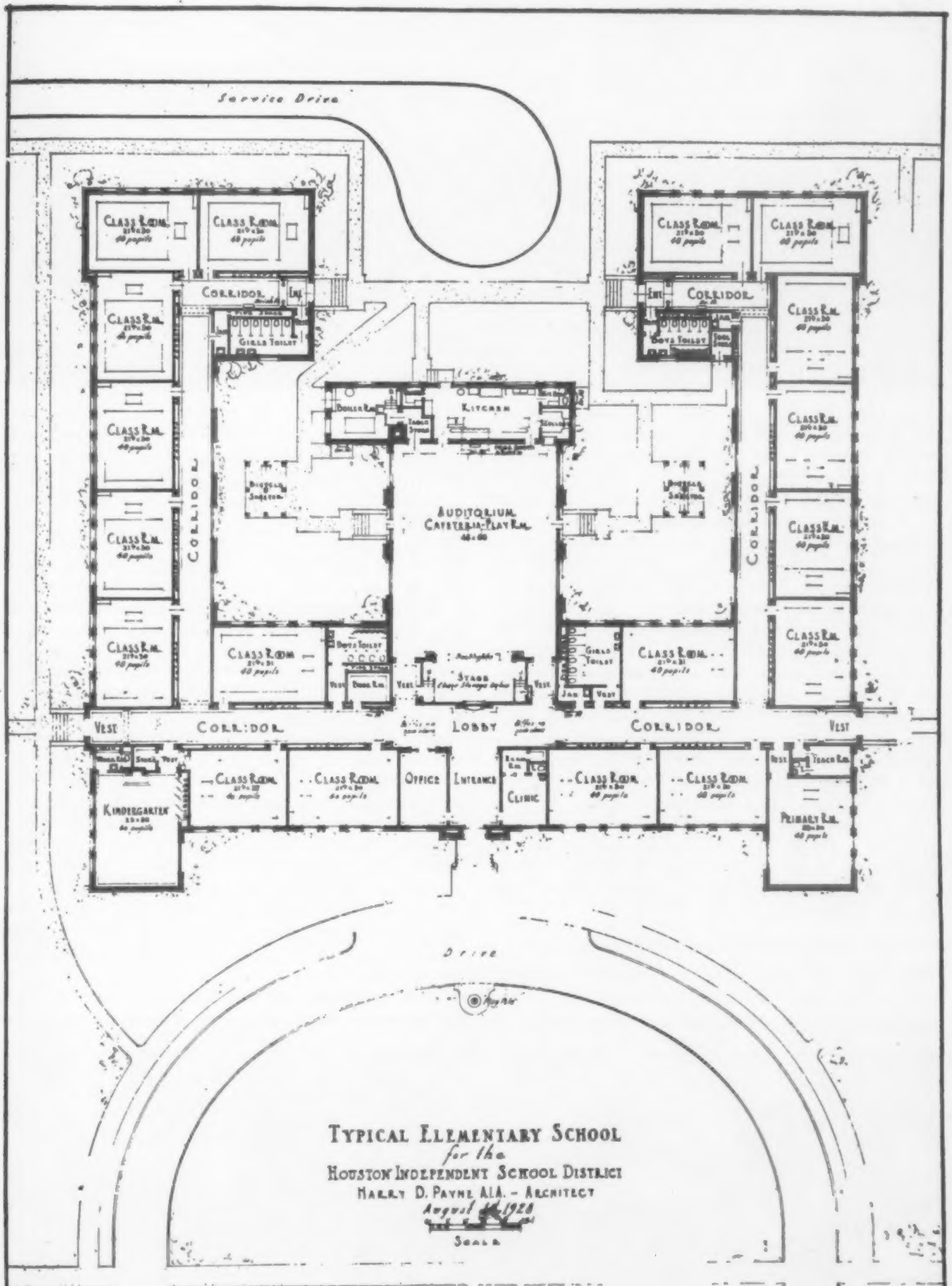
POSSIBLY no more interesting problem has come to the attention of this writer than the commission entrusted to him by the Board of Education of the Houston Independent School District which provided for the erection of six elementary schools from a typical plan. There are not very many parts of the United States in which it would be entirely feasible to work out such a project. In the Gulf Coastal Plain our sites are so level and uniform that topography variations play but little part in our design problems. In making the assignment, the Board of Education and its officials stipulated that each school must offer identical facilities, but that the exterior design should be varied to such an extent as to give each school an entirely separate individuality.

In the elementary school educational program there can be but little variation, and, in fact, it is desirable that the principal elements of the program shall be uniform throughout an entire school system. Through this means each child advancing to the junior and senior high schools has been offered substantially the same preparation.

A One-Story Flexible Plan

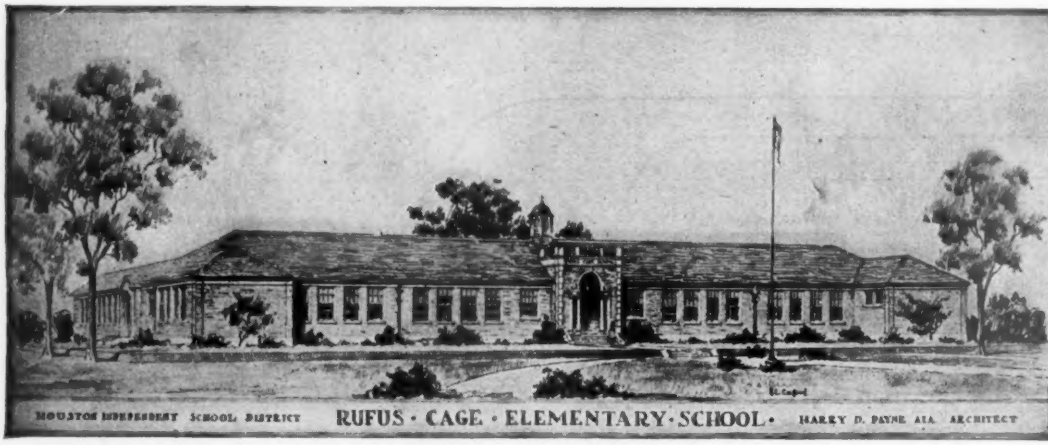
The basic plan for the group of buildings assigned to this architect provides a twenty-classroom unit, with a pupil capacity of 800 pupils. The plan is a one-story type, simple and direct, and thoroughly devoid of plan complexities. It should be borne in mind that while the plan presented is used as a typical plan, it is nevertheless a very flexible plan. It permits a variety of arrangements of the several parts of the com-





PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Auditorium Seats—Royal Metal Mfg. Co.
Boilers—Heggie-Simplex Boiler Co.
Clocks and Signal Systems—Landis Clock Company and Standard Electric Time Co.
Drinking Fountains—Halsey W. Taylor Co.
Heating Specialties—Beaton-Cadwell Mfg. Co.
Lockers—Lyon Metal Products, Inc.
Partitions—Toilet—Henry Weis Mfg. Co.
Plumbing Fixtures—N. O. Nelson Co., Crane Co. and Standard Sanitary Mfg. Co.
Refrigeration Equipment—Frigidaire Corp.
Roofing—The Barrett Co. and Texas Co.
Ventilation Specialties—Ilg Electric Ventilating Co.
Water Heating Equipment—Sims Co.



HOUSTON INDEPENDENT SCHOOL DISTRICT RUFUS · CAGE · ELEMENTARY · SCHOOL · HARRY D. PAYNE A.I.A. ARCHITECT

plete plan to suit the particular conditions of any number of individual schools with similar general requirements. It allows for the erection of units of six, eight, ten, twelve, or more rooms, with or without the auditorium-cafeteria-play room unit. Ample sites were available in the sections to be served by these buildings. This factor, combined with the past policies of the Houston Board, indicated the desirability of resorting to a one-story structure.

The construction is as simple and direct as is the plan. In consideration of the one-story element and of the necessity of utilizing an economical system of construction, the floors, with the exception of the corridor, clinic, and toilets, have been framed in wood. The first floor line is established well above the natural grade, thus allowing a working space below the first floor for steam, water and gas pipes and other utilities. The exterior grade beam is of reinforced concrete construction. To provide a proper support for tile floors in the clinic and toilets, and for the terrazzo floors in the corridor, these portions have been framed in concrete.

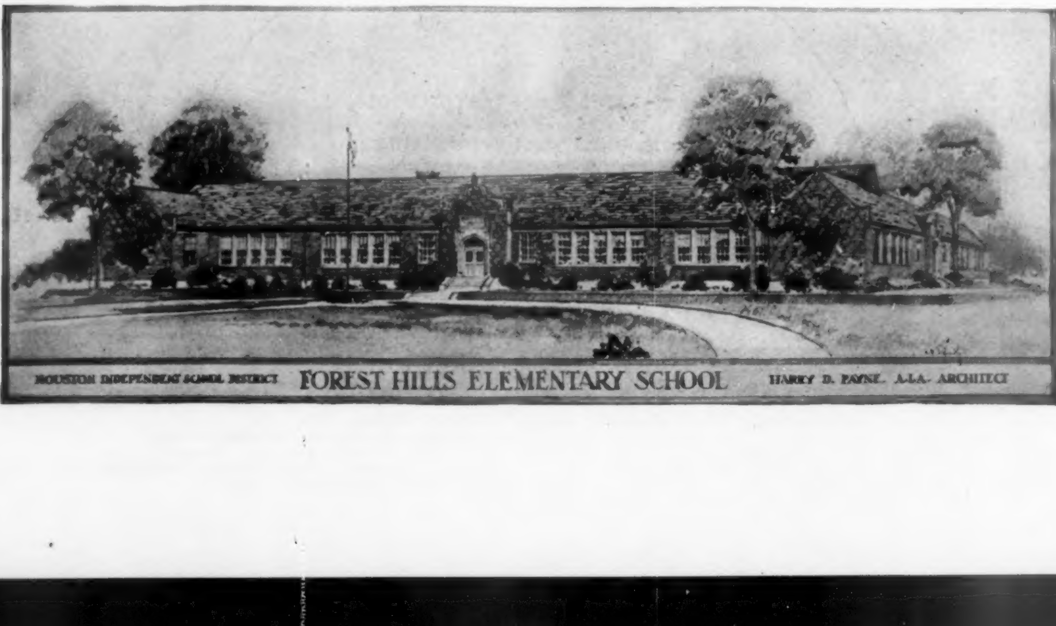
The Auditorium-Cafeteria-Play Room

The plan offers no particular features requiring explanation, with the possible exception of the auditorium-cafeteria-play room. The policy of utilizing a combination room serving a threefold purpose for elementary schools was evolved and adopted in the 1925-26 building program, for which the writer served as supervising architect. For auditorium purposes, the room is seated with folding chairs, which may be stored on trucks under the stage when not required. The cafeteria tables are light-weight folding tables, which when not in use are stored in the table storage room.

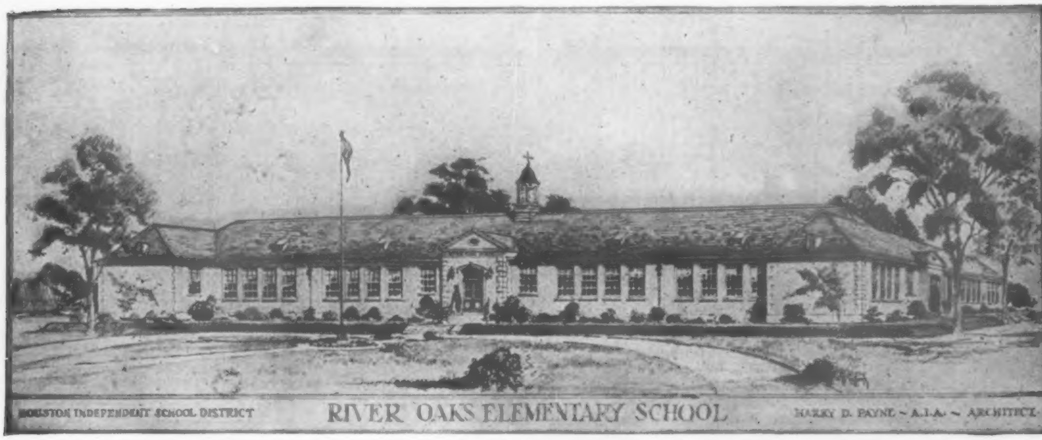
The auditorium-cafeteria-play room has a seating capacity of 375 persons and has a clear play space of 45 feet by 60 feet. The kitchen is entirely separated from the larger room by a solid wall. During the lunch period, access to the serving counter is gained through entrance and exit doors allowing pupils to file past the service counter, secure their lunch, and then carry it to the tables, where they eat in class groups. On completing lunch, each pupil carries his tray and soiled dishes to the window opening into the dishwashing space. This window has four or five shelves for the storing of trays, thus enabling one worker to handle the soiled-dish situation.

The sanitary and mechanical features of the school are thoroughly modern and conform with the best national practice. The boiler is fired with natural gas.

The variations of the exterior designs of the buildings provided, of course, a problem of archi-



HOUSTON INDEPENDENT SCHOOL DISTRICT FOREST HILLS ELEMENTARY SCHOOL HARRY D. PAYNE A.I.A. ARCHITECT



tectural interest. The plan once established, as stated above, was substantially identical for each school. Desiring to secure the maximum differentiation, the buildings were designed in widely different styles of architecture, and the exterior materials were varied to a very considerable extent. Stated in brief, the exterior design problem was solved as follows:

Exterior Individuality of the Six Schools

Chevy Chase Elementary School.—The Georgian or restrained American-Colonial style served as the prototype of this design, which was executed in a light pink, velour-textured brick. The roof is of variegated natural slate, the colors ranging from black through blue, purple and unfading green. All of the sheet metal work for the entire group of buildings is of copper weathered to a natural hue.

The Rufus Cage Elementary School has substantially the same exterior materials, but its entrance pavilion with dominant paladian motif tends to fix the style as Italian Renaissance.

The Eugene Field (Studewood) School is of the type generally designated as Mediterranean—that is, it partakes of certain Italian and Spanish influences. The general wall treatment is salmon pink stucco applied in rough texture. The tile roof has interesting hues ranging from fire-flashed purple and brown to light buff. The terra cotta trim is a pulsichrome buff tone touched up with polychrome work. A further color note is given by the red brick window sills and the wood trim, which is painted to harmonize with the body color of the terra cotta. This school has a particularly happy setting in a grove of towering pine trees, which adds to its effectiveness.

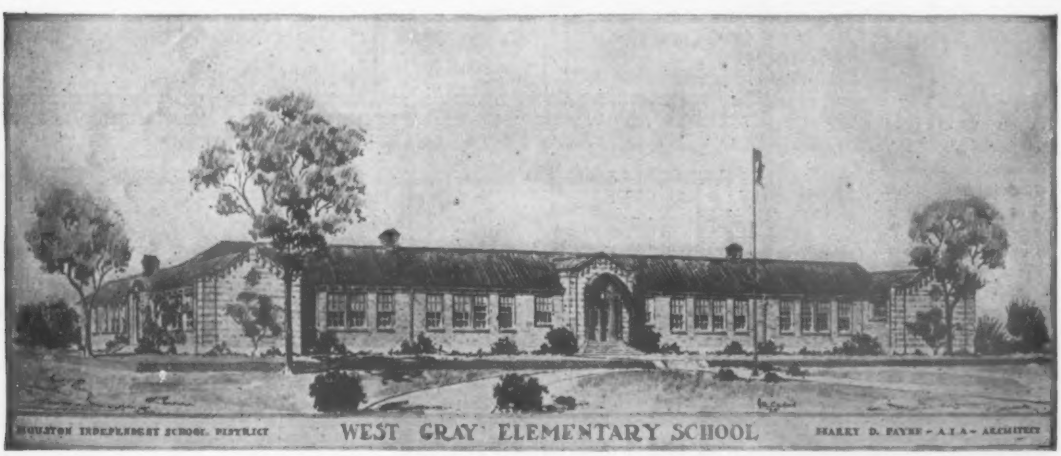
The Forest Hill Elementary School expresses certain English motifs. It is executed in darker tones of red brick mingled with fire-flashed headers in pattern work. The trim is of Texas limestone. A steep roof covered with blue-black slate dominates the entire design.

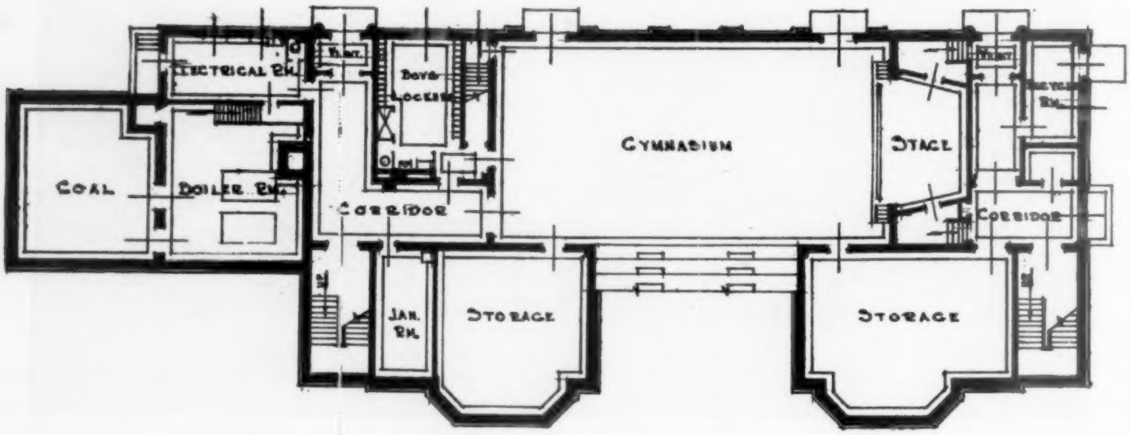
The design of the *River Oaks Elementary School* is suggested by the French Colonial of New Orleans and also by the design of some of the minor French châteaux. The exterior trim is Texas limestone. The textured stucco is light buff in color; the natural slate is similar to that utilized on the Chevy Chase and Rufus Cage Schools.

The West Gray School is reminiscent of the Lombard Italian work and is executed in light buff velour-textured brick in full range of colors. The tile roof is of soft browns and grays. The trim is reddish buff cast stone similar to brown sandstone.

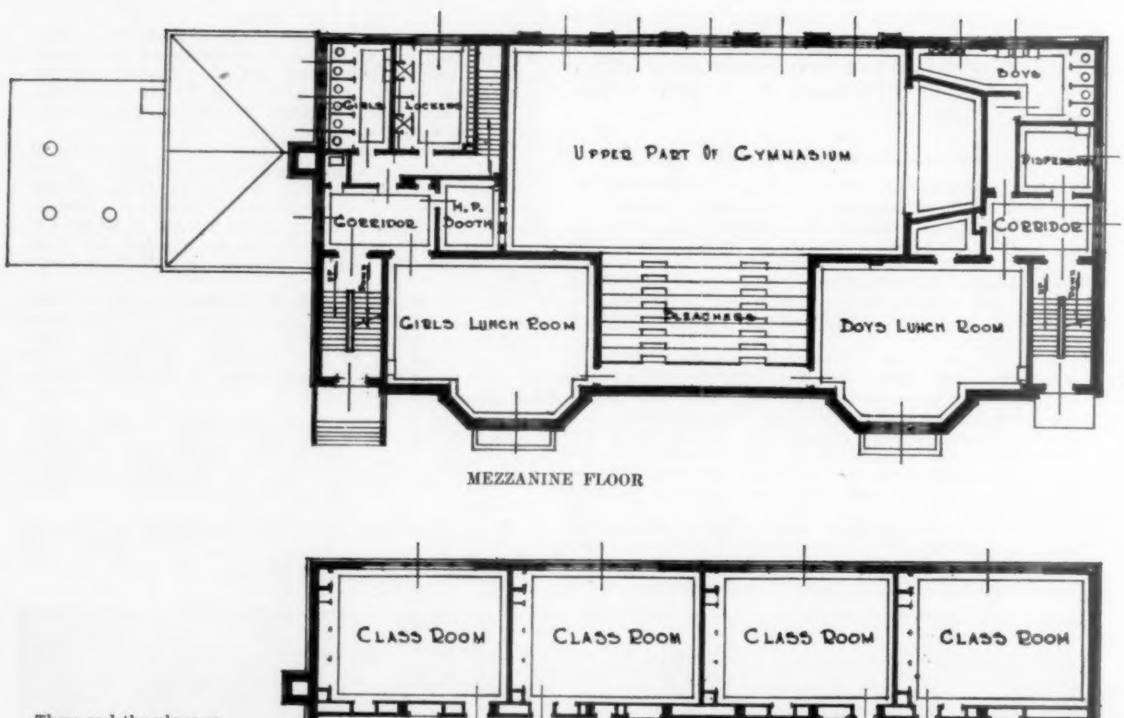
In general, the results obtained have been very gratifying. Each school has been studied in order to carry out its own particular architectural idea accurately, and with dignity.

E. E. Oberholtzer is Superintendent of Schools of The Houston Independent School District, and H. L. Mills, Business Manager.

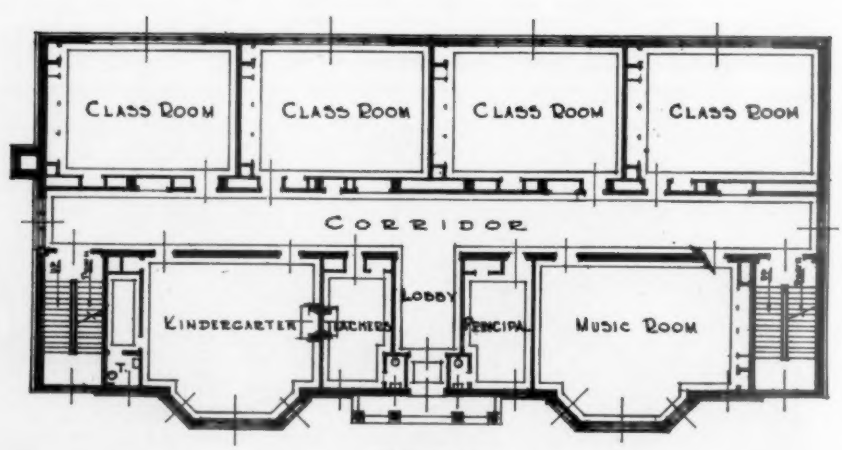




BASEMENT PLAN, ROSLYN VILLAGE SCHOOL



MEZZANINE FLOOR



These and the plans on the next page are reproduced at a scale of 1-32-inch to 1 foot.

FIRST FLOOR

Floor plans by courtesy of W. B. Tubby, Architect, New York

New Grade School at Roslyn Provides Wide Range of Activities

BY JAMES B. WELLES

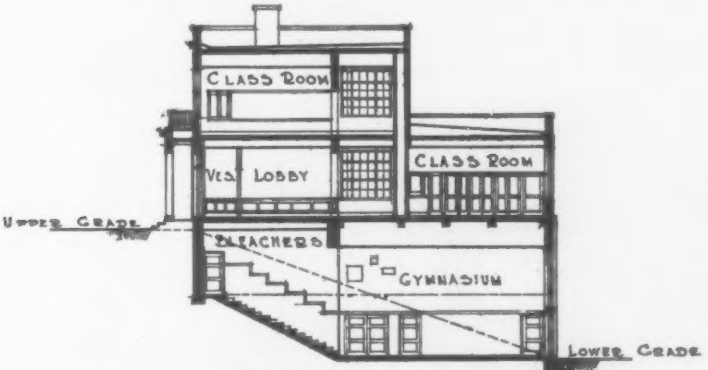
SUPERINTENDENT OF SCHOOLS, ROSLYN HEIGHTS, N. Y.

THE new grade school at Roslyn was designed to carry out an activity program so far as possible with the funds at hand, and in the light of ordinary public school experience. The building will comfortably accommodate 250 pupils. It contains six standard classrooms, a kindergarten suite, a library, a special music room, a special activities room for handwork, household arts and similar processes, a lunch-room, a combination gymnasium and auditorium, together with special shower- and dressing-rooms for boys and girls. The usual administrative rooms are also included.

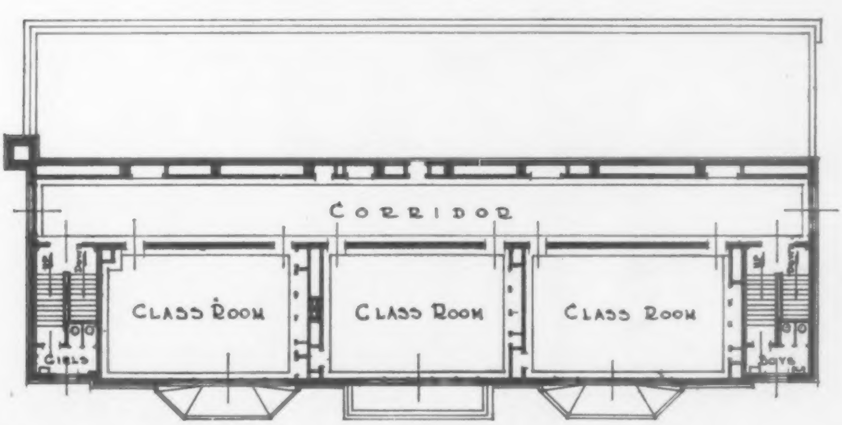
The classrooms have special coat closets, similar to the Evans type but of our own design, and storage spaces for educational materials. Less space is given on the walls for blackboards and more is taken with bulletin boards of cork. Only movable furniture is used. In the kindergarten and first three grades are installed chairs and linoleum-topped tables; each table is large enough to accommodate two children. The three highest grades are equipped with individual chairs and individual tables. A special round reading or library table and a manual training bench are found in each classroom for grades 1 to 3. The special activities room is equipped for the miscellaneous activities of grades 4 to 6.

The library houses the books for the whole school and offers good accommodations for reading or study and allied activities.

The music room is a small auditorium seating approximately 75. The auditorium-gymnasium



SECTION, ROSLYN VILLAGE SCHOOL



SECOND FLOOR

will seat about 400, and has a good stage for dramatic work. A series of concrete steps at one side of the gymnasium floor provide seats for about 200, so that athletic games and large-scale productions may be held and a good-sized audience may be taken care of at the same time.

A central radio receiving set distributes radio programs to each room where groups may congregate; a pick-up for broadcasting records instead of radio programs is also connected with the radio, thus making possible music memory contests, musical ability tests and the like.

In the halls are located illu-

THIRD GRADE

KINDERGARTEN

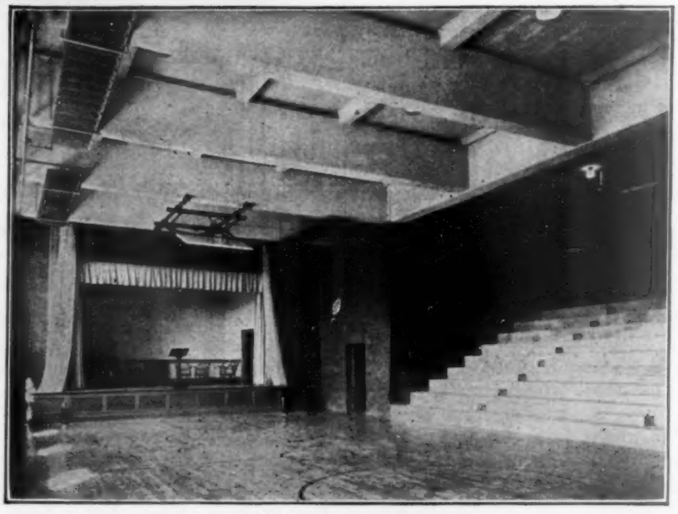
It is above and away from heavy traffic and stands under the brow of a beautiful wooded hill. The school property is slightly over three acres in extent.

The total cost of this plant, including land, building and equipment, will not exceed $240,000.

minated display cases, one for each class. These cases are about six feet square and are built flush into the walls.

The kindergarten suite has a bay-window and seat; the seat is also a storage space for blocks, etc. There is a real wood-burning fireplace faced with Mother Goose tiles in this room, which adds a tone of cheeriness and informality to the setting.

The school is set upon a side hill looking across the harbor and Long Island to the mainland some fifteen miles away.



AUDITORIUM-GYMNASIUM

Construction of Buildings for the Platoon School

BY DAVID A. WARD

SUPERINTENDENT OF SCHOOLS, WILMINGTON, DEL.

DURING recent years, the platoon type of school organization has spread rapidly throughout the country until it has become established as a distinct type of administrative unit. In the operation of the platoon school, the plan of the building is an important consideration.

Whereas in the traditional school the entire building is used for the work of classroom study and instruction, in the platoon school facilities must be provided so that all the activities of work, study and play may be in progress at the same time. While some of the children are engaged in the work of the classroom, others are in the library, gymnasium and other special rooms, and still others are at play. The program must be arranged so that all these activities may proceed simultaneously and so that all the children may have equal opportunities to participate in all the activities.

For convenience, the school is divided into two equal divisions, or platoons. While one-half of the school is engaged in the regular classroom work of the academic subjects, the other half is distributed in various groups of special activities. After a definite period, usually one-quarter of a day, the platoons exchange places and the program is repeated. This plan implies building facilities that will provide suitable rooms, shops and play areas to accommodate one-half the school while the other half is occupying the regular classrooms.

The special activities may be of any chosen type. The auditorium, the gymnasium, and the library are common to all platoon schools. Any building, therefore, which is designed for the operation of a platoon organization should be provided with these three facilities. Other rooms usually provided are for music, literature, science, art, and shop work. According to the nature of the platoon school, the total pupil capacity of the special activity rooms must equal that of the regular classrooms in any building.

It is not necessary that all of the special rooms differ materially from regular classrooms. Play space must be provided either in a room or in a covered area for use in inclement weather. Outdoor playgrounds may be used when the weather will permit.

The building should be planned so that as far as possible the rooms for the special activities may be located on the first floor. All home rooms, or regular classrooms, should be on the same floor as far as possible. A typical platoon organization provides one hour and a half in the home room each half-day session, with three 30-minute periods in the special rooms. The passing of pupils, therefore, among the special rooms is much more frequent than between the special rooms and home rooms.

The second floor is preferable to the first for the home rooms, especially when the gymnasiums or playrooms are on the basement floor, as it reduces the time and effort in climbing stairs. It is also preferable from the standpoint of working conditions. If the special activity rooms are located on the first floor, the home rooms are relieved of any annoyance that might be caused by the frequent changing of classes in the special activities. In a building of any considerable size, there should be at least two stairways at opposite ends of the building, not only to lessen the fire and panic hazard but to facilitate the traffic of classes. Classrooms should be provided with two doors opening into the same corridor, as this arrangement facilitates the movement of classes.

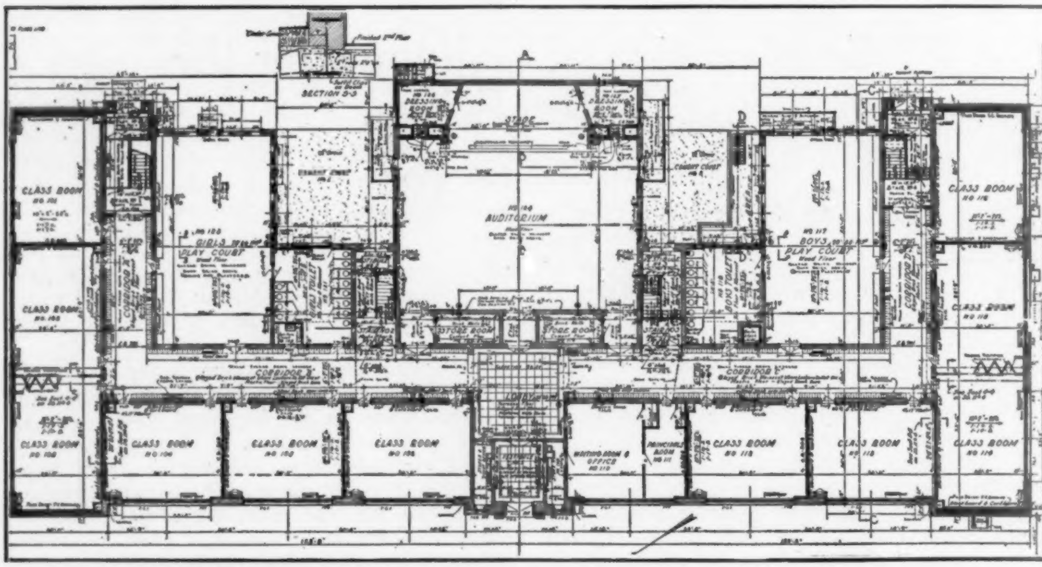
With the exception of the auditorium and the gymnasiums, additional size, where demanded by the special activities, may be provided by combining standard rooms. The specifications of rooms as given in the following paragraphs are the result of experience in planning and operating new buildings for the platoon school.

Library

In every new school a library should be planned. A convenient library can be provided by planning two standard classrooms thrown together end to end. This will make a room about 62 feet x 23 feet and is adequate for a building that will accommodate about 1,000 pupils. The room should be lighted from one side according to the regular plan of lighting classrooms. A folding partition should be provided in the middle so that, when desired, the room may be divided into two standard classrooms. When not in use, the partition should fold into a closet in the side of the room. Blackboard space and bulletin boards should be provided, and the room should be equipped with regular library tables, desks, chairs and magazine racks.

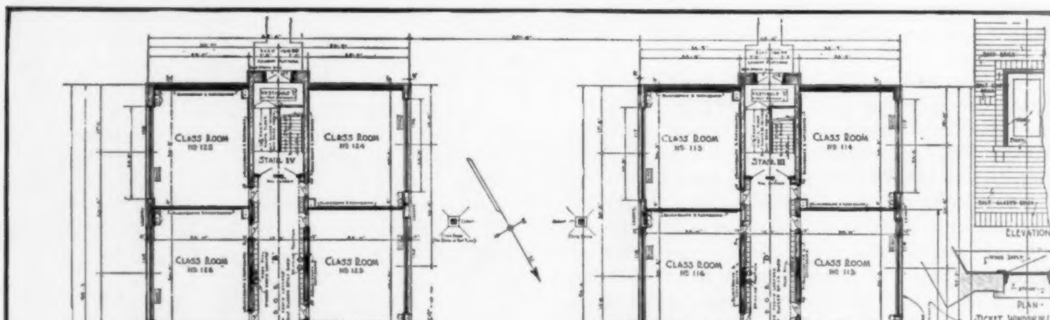
Nature Study Room

For nature study, a standard classroom may be used. It should be provided with two demonstration tables and with library tables. A large case with drawers of various sizes, and shelves enclosed with glass doors, should be provided. It should be so located that it can contain an extension for a conservatory and should be provided with running water and an aquarium.



FIRST FLOOR PLAN OF WILLIAM P. BANCROFT SCHOOL, WILMINGTON, DEL.

Showing location of play courts and convenient arrangement of auditorium and principal's office, with classrooms located for best lighting



Floor plans by courtesy of Guilbert & Betelle, Architects, Newark, N. J.

FIRST FLOOR PLAN OF THOMAS F. BAYARD SCHOOL, IN WILMINGTON

Showing convenient arrangement of classrooms, auditorium, principal's office, and medical inspection room. Rooms Nos. 110 and 111 are separated by folding partition, making a library which can be divided for instruction if desired. Rooms Nos. 128 and 129 are divided by folding partition for kindergarten use

Art Room

The art room should be, in floor space, about equal to one and one-half standard classrooms. It is preferable that this additional size be added to the width rather than to the length of the room. The room should be so located that the light will enter from the north. It should be provided with blackboard space and cork boards around the room, a shelf above the blackboard, with running hot and cold water and a sink. Besides desks for the students, the equipment should include a teacher's desk and chair, tables for book work and posters, a museum cabinet, a table with large drawers for sheet paper, cork board screens for posting drawings, a cabinet with large pigeon-holes for unfinished class drawings, a similar cabinet for completed drawings, a cabinet for supplies, a bookcase, small adjustable stands or tables for objects to be drawn, a projecting lantern and a small press for block writings.

Auditorium

The auditorium in a platoon school is the integrating unit of the school and is built primarily as a workshop. It is therefore unnecessary to provide a large auditorium unless the demands of the community are such that it is necessary to use it for community meetings as well as for school purposes. For a distinctly platoon school workshop, the capacity of the auditorium should be about 100 to 125 pupils, enough to accommodate two groups with sufficient capacity for an overflow group when needed. The room should be equipped with auditorium chairs. It should have a piano and Victrola, with screens for stereopticon and moving-picture exhibitions. It should be equipped with a fireproof moving-picture booth in the rear with a standard machine installed. The stage should be ample in size to accommodate dramatizations and children's plays. It is important that the dressing-rooms be so located that they can be entered from some other part of the building than the auditorium itself. The auditorium should be so located with relation to other parts of the building and the playground that the noise of gymnasiums, playgrounds or shops will not be disturbing to the work. This is important, inasmuch as the auditorium is in use all of the time during the day.

Gymnasiums

There should be two gymnasiums, each about 70 feet in length and 40 feet in width, with a ceiling 16 to 20 feet high. They should have wood floors. Storage rooms conveniently located for movable apparatus should be provided, as well as dressing-rooms for the instructors. Each gymnasium should be located far enough away from classrooms and auditorium that there will be no disturbance of study or class exercises. There should be windows on three sides for adequate lighting.

Play Court

For use in inclement weather, there should be a play court, equal in capacity to two standard classrooms, so located as to be away from classrooms and auditorium. It should be provided with seats on each side. It should be equipped with apparatus for indoor games. The floors should be of wood, and the ceiling should be high with lights protected by wire guards.

Cafeteria

In a school that will accommodate 1,000 or more pupils, a cafeteria is usually desirable. That depends, of course, upon the local conditions and the distance which pupils are required to travel. Ordinarily a school of that size should be provided with a cafeteria which would accommodate at one time approximately one-third of the school population.

Other Requirements

For other special activities, a standard classroom is usually satisfactory. The room should be equipped, of course, in accordance with the type of activity for which it is set aside. The important thing is that the total pupil capacity of all the special-activity rooms must equal the total capacity of all the regular classrooms or home rooms.

Since the platoon organization involves the activities of two equal groups of students, it can be operated only with even numbers of classes, as eight, twelve, sixteen, twenty-four. It is therefore necessary, in planning a building for this type of school, to provide a few additional standard classrooms to accommodate any odd groups that cannot be accommodated in the platoon organization. The policy varies in regard to the primary grades. In some school systems, first-grade children are included in the platoon organizations; in others, the first grade and sometimes the second and third are kept on the traditional plan. The policy in force will determine, of course, the number of additional rooms.

(See next page for a list of Cities Having One or More Schools on the Work-Study-Play or Platoon System.)

Cities Having One or More Schools on the Work-Study-Play or Platoon Plan

THROUGH the courtesy of W. S. Deffenbaugh, Chief of the City Schools Division of the U. S. Bureau of Education, the following list is published of cities and counties having one or more schools on the work-study-play or platoon plan:

154 CITIES IN 39 STATES:

Alabama:
Bessemer
Birmingham

Arizona:
Bisbee
Mesa
Phoenix
Tucson

Arkansas:
Crossett
Fort Smith
Hot Springs
Little Rock
Morrilton
Stuttgart
Texarkana
Van Buren

California:
Burbank
Glendale
Long Beach
Sacramento
San Diego
Santa Monica

Colorado:
Brush
Colorado Springs
Denver
Fort Morgan
Greeley
Pueblo (Districts Nos. 1 and 20)

Connecticut:
Bridgeport
Greenwich
Hartford
Middletown
New Britain

Delaware:
Wilmington

District of Columbia:
Washington

Florida:
Tampa

Illinois:
Brookfield
Chicago
Granite City
LaGrange
Lombard
Rockford
Streator

Indiana:
East Chicago
Gary
Shelbyville
South Bend

Iowa:
Ames
Newton

Kansas:
Cherryvale

Louisiana:
New Orleans

Maine:
Calais
Woodland

Maryland:
Baltimore

Massachusetts:
Stoughton

Michigan:
Detroit
Flint
Hamtramck
Kalamazoo
River Rouge
Royal Oak
Saginaw

Minnesota:
Duluth
St. Paul

Missouri:
Kansas City
Lexington

Montana:
Deer Lodge

New Hampshire:
Concord

New Jersey:
Asbury Park
Franklin
Irvington
Jersey City
Montclair
Newark
Passaic

New York:
Mount Vernon
Rochester
Troy (Union District)

North Carolina:
Durham
Fayetteville
Wilmington
Winston-Salem

North Dakota:
Fargo
Grand Forks

Ohio:
Akron
Barberton
Cleveland
Cuyahoga Falls
Dayton
Greenfield
Shaker Heights Village School District, Cleveland
Warren
Youngstown

Oklahoma:
Ponca City
Tulsa

Oregon:
Bend
Newberg
Portland
Rainier

Pennsylvania:
Braddock
Brentwood
Chester
Donora
Dormont (Post Office, Pittsburgh)
Easton
Ellsworth
Ellwood City
Erie
Hazleton
Langeloth
Latrobe
Monessen
Mt. Oliver (Post Office, Pittsburgh)
New Castle
New Kensington
Oakmont
Parnassus
Pittsburgh
Portage
Sewickley
Wilmerding

Rhode Island:
Bristol
Providence

South Carolina:
Dillon
Greer
Parker District, Greenville
Walterboro

Tennessee:
Johnson City
Knoxville
Memphis

Texas:
Austin
Belton
Breckenridge
Burkburnett
Cameron
Dallas
Denison
Farwell
Lamesa
McAllen
Port Arthur
South Park School District, Beaumont
Temple
Tyler

Utah:
Ogden
Salt Lake City

Virginia:
Bristol
Hopewell

Washington:
Renton
Seattle
Spokane
Walla Walla

West Virginia:
Huntington
Morgantown
Wheeling

Wisconsin:
Kenosha
Milwaukee

2 COUNTIES IN 2 STATES

Michigan:
Redford Union Schools, Wayne County

Tennessee:
Shelby County

2 PRIVATE SCHOOLS IN 1 STATE

Pennsylvania:
Carson College, Flourtown
Girard College, Philadelphia

Articles on School Buildings Published in 1927 and 1928 in THE PLATOON SCHOOL*

"Planning Work-Study-Play Buildings," by William B. Ittner—June, 1927.
"The Frances E. Willard School as Organized in Long Beach, Calif., by W. L. Stephens—October, 1927.
"How Portland Would Organize the Willard School," by Charles A. Rice—October, 1927.
"How Detroit Would Organize the Willard School," by Rose Phillips—December, 1927.
"How Gary Would Organize the Willard School," by John G. Rossman—December, 1927.
"The Newton Plan," by B. Conrad Berg—April, 1928.
"Planning Buildings for Platoon Schools," by John G. Rossman—December, 1928.

* Publication office, 532 Seventeenth Street N. W., Washington, D. C.

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Built like a Highway ~ for Wear

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A thin asphalt tile of extraordinary durability. Only high-grade asphalts used. The skillful blending of the asphalts with asbestos fiber and non-fading coloring pigments forms a durable, permanently resilient wearing surface.

No sand, paper or rubber filler is used; nothing to hold dirt, rapidly oxidize or shorten the life of the tile.

PROPERTIES

Durability—The wearing quality of Rubberstone Flooring is truly remarkable. The entire thickness is usable as wearing surface. The tile is of uniform composition and character throughout its thickness.

WATER AND DAMPNESS RESISTANCE

The base of Rubberstone Tile is asphalt which makes it non-absorptive. It can be used on basement floors, and dampness that comes up through the subfloor will not affect the tile or the asphalt cement in which the tile are laid.

NON-STAINING

Stains do not penetrate and can be easily washed off. Ink, match and cigarette marks are easily removed. Highly acid- and alkaline-resisting.

FIRE RESISTANCE

A large percentage of asbestos fibre is used in the manufacture of Rubberstone so that the tile are highly fire-resistant.

RESISTANCE TO AGE

The tile do not harden, scuff up or become shabby from age. It is a well established fact that a Rubberstone Flooring actually improves under use.

ODORLESS

There is no odor released from the tile.

RESISTANCE TO SLIPPING

The nature of the material is such that sureness of footing is given at all times.

MAINTENANCE

Waxing is not necessary but when a waxed finish is desired the best results are obtained by using Rubberstone Wax. Oils should never be used on the tile as any appreciable quantity will soften the surface. For washing the floor, we recommend the use of soaps such as "Clean-O-Shine," "Briten-all" and "Gold Dust" used in accordance with the manufacturer's instructions. Sweeping compounds are frequently used with satisfaction, and prove non-injurious to the flooring when dampened with water or with a small amount of kerosene.

CHANDLER LABORATORIES, COLUMBIA UNIVERSITY, NEW YORK CITY

Archts. McKim, Mead & White, New York City

Rubberstone has been installed in all rooms, corridors, stair treads and platforms of this building—an approximate area of 60,000 square feet.

WAUKEGAN JR. HIGH SCHOOL, WAUKEGAN, ILL.
Archts. Shattuck & Layer, Chicago, Ill.

In this modern school, Rubberstone has been used in all class rooms and corridors—a combination of green and tan, standard ⅛ inch thickness.

COSTS

Costs vary with size of tile, thickness of tile and color selection. It is of advantage whenever possible to make color selections, etc., when writing specifications or asking for prices and estimates.

COLORS

There are eight color selections: Gray, tan, light red, dark red, olive green, ivy green, mahogany and black. The lighter colors cost more than the darker colors.

SIZES

Five standard sizes: 6 x 6 in., 9 x 9 in., 9 x 27 in., 12 x 12 in., and 12 x 24 in.

THICKNESSES

Two thicknesses: ⅛-in. and 3/16-in. The ⅛-in. is the standard thickness and is suitable for most types of service. The 3/16-in. is recommended for stair treads, landings, elevator floors, and for other places subject to continuous, hard traffic. In general, in the case of wood floors, best results are obtained by the installation of a Rubberstone Undercoat, approximately ⅜-in. in thickness, applied directly over the lumber base with a reinforcement of wire mesh, and troweled to a smooth level finish. The standard ⅛-in. thickness is laid directly over the Rubberstone Undercoat. The years of service that Rubberstone will give can not be gauged by its thickness. Rubberstone is a concentrated flooring.

SPECIFICATIONS FOR RUBBERSTONE

For the guidance of architects, the following simple form of specifications is suggested:

All finished floors in .... (specify spaces) .... shall be Rubberstone Tile Flooring, manufactured by the **Rubberstone Corporation** and installed by them or their duly authorized agent. Thickness of tile shall be ⅛-in. [3/16-in.]. Size of tile shall be 9 x 9 in. [6 x 6 in.] [12 x 12 in.] [9 x 27 in.] [12 x 24 in.]. Colors: [Mahogany] [ivy green] [olive green] [light red] [dark red] [black] [tan] [gray].

All Rubberstone Tile shall have a calendered surface; shall contain no sand, grit or rubber filler; and shall be equal in color and quality to samples held by the architect.

All Rubberstone Tile shall be installed in strict accordance with manufacturer's specifications and guaranteed as to quality of materials and workmanship for a period of one year.

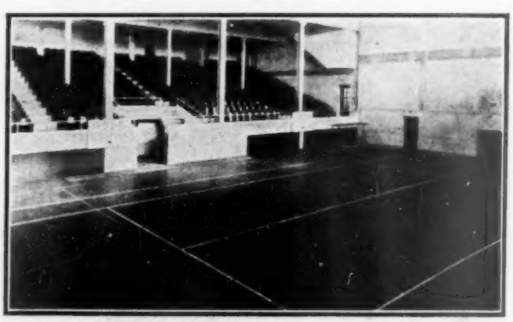
PREPARATION OF SUBFLOORS TO RECEIVE RUBBERSTONE

OVER CEMENT SUBFLOORS

All portland cement floors upon which Rubberstone Tile Flooring is to be applied are to be furnished to the Rubberstone contractor in place, of sound, solid cement, free from scale or chalky deposits, to a true, even grade and with smooth steel-troweled surface at a distance below the established grade of the finished floors equal to the thickness of tile specified.

OVER WOOD FLOORS

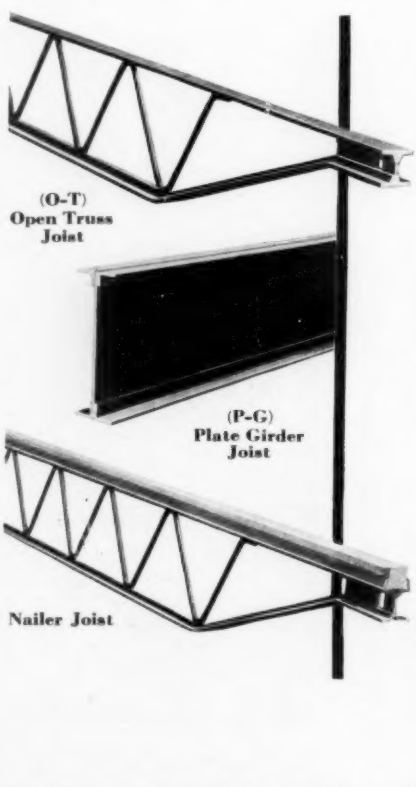
All wood floors to serve as grounds for Rubberstone Tile Flooring must be furnished to the Rubberstone contractor in place of single or double construction composed of well seasoned lumber to minimize the possibility of warping at a later date. They shall be structurally sound, securely nailed, and there shall be no springy boards or loose butts. The wood floor shall be ½-in. below the grade of the finished Rubberstone Tile Flooring where the standard ⅛-in. thickness of Rubberstone Tile is to be used. The pitch or level must be given to the Rubberstone contractor in the subfloor. The Rubberstone contractor shall furnish and install a Rubberstone Undercoat, approximately ⅜-in. in thickness, directly over the lumber base with a reinforcement of wire mesh and troweled to a smooth level finish. The Rubberstone Tile shall be firmly cemented in Rubberstone Asphalt Cement directly to the top of the Undercoat.



GYMNASIUM OF DUNWOODY INDUSTRIAL INSTITUTE, MINNEAPOLIS, MINN.
Archts. Hewitt & Brown, Minneapolis, Minn.

TRUSCON STEEL COMPANY, YOUNGSTOWN, OHIO

WASHINGTON LEE HIGH SCHOOL
BALLSTON, VA.
Upman & Adams, Architects



Fireproof Floor Construction

Necessity for fire safety in school construction has been impressed upon the public mind by many tragedies. But not only must outside walls and roof be planned for fire resistance but it is vital that the floor must provide absolute protection from fire.

For the floor construction Truscon Open-Truss Steel Joists insure not only fire safety of the highest type but also strength, rigidity and sound-proofness. Steel Joist construction is quickly erected without forms or centering. Its light weight effects savings in the supporting structural work, thus augmenting the economy of its initial low cost.

Truscon furnishes three types of Steel Joist to efficiently meet any building requirement. All Truscon Steel Joists represent the highest quality in materials, design and workmanship.

TRUSCON

TRUSCON STEEL COMPANY, YOUNGSTOWN, OHIO

CALUMET HIGH SCHOOL
CHICAGO, ILLINOIS
Architect: J. C. Christensen

Beautiful Walls and Ceilings

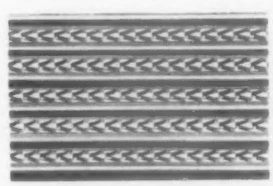
The growing recognition in educational circles of the importance of atmosphere in school rooms makes the permanent beauty of walls and ceilings a matter of first consideration.

Truscon Metal Lath assures such permanent beauty by safeguarding walls and ceilings against cracks and other ugly discolorations. It also provides the important advantage of reducing the fire hazard. Fire originating in any part of a building can be confined to the place where it started if walls and ceilings have the protection of steel in the form of Truscon Metal Lath behind the plaster.

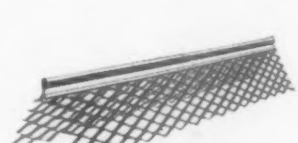
Among the popular types of Truscon Metal Lath are 1-A and 2-A Metal Laths, 3/8" and 3/4" Hy-Ribs, Diamond "A" Lath and Diamond Rib Lath. The complete line includes corner-beads, cornerite, channels and metal trims.

TRUSCON

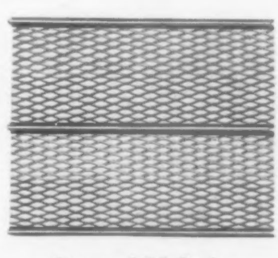
TRUSCON STEEL CO.



"A" Metal Lath



Expanded Corner Bead



Diamond Rib Lath

CRANE CO.

Plumbing and Heating Materials for Every Purpose

CRANE CO. GENERAL OFFICES

Crane Building, 836 South Michigan Ave.

CHICAGO, ILL.

National Exhibit Rooms:—Chicago, New York, Atlantic City, San Francisco, Montreal
Works:—Birmingham, Chattanooga, Trenton, Montreal, St. Johns, Bridgeport, Chicago

BRANCH HOUSES

Aberdeen	Cincinnati	Hibbing	Minneapolis	Providence	Sioux Falls
Albany	Cleveland	Hollywood	Mobile	Reading	South Bend
Albuquerque	Davenport	Houston	Muskogee	Reno	Spokane
Asheville	Denver	Indianapolis	New Orleans	Richmond	Springfield, Ill.
Atlanta	Des Moines	Jacksonville	Newark	Rochester	Springfield, Mass.
Atlantic City	Detroit	Jersey City	New Haven	Rockford	Springfield, Mo.
Aurora	Duluth	Joliet	New York	Sacramento	Syracuse
Baltimore	East Chicago	Kansas City	Norfolk	St. Louis	Tacoma
Billings	El Paso	Knoxville	Oakland	St. Paul	Tampa
Birmingham	Evanston	Lexington	Ogden	Salt Lake City	Terre Haute
Boston	Evansville	Lima	Oklahoma City	San Antonio	Trenton
Bridgeport	Fargo	Little Rock	Omaha	San Bernardino	Tucson
Brooklyn	Ft. Smith	Long Beach	Oskosh	San Diego	Tulsa
Buffalo	Grand Junction	Los Angeles	Pasadena	San Francisco	Washington
Camden	Grand Rapids	Macon	Philadelphia	Santa Ana	West Palm Beach
Casper	Great Falls	Madison	Phoenix	Santa Barbara	Wichita
Cedar Rapids	Greensboro	Mankato	Pittsburgh	Savannah	Wilkes-Barre
Charleston	Greenville	Mason City	Pocatello	Seattle	Winona
Chattanooga	Harlingen	Memphis	Portland, Me.	Shreveport	Youngstown
Chicago	Hartford	Miami	Portland, Ore.	Sioux City	

CRANE SCHOOL SERVICE

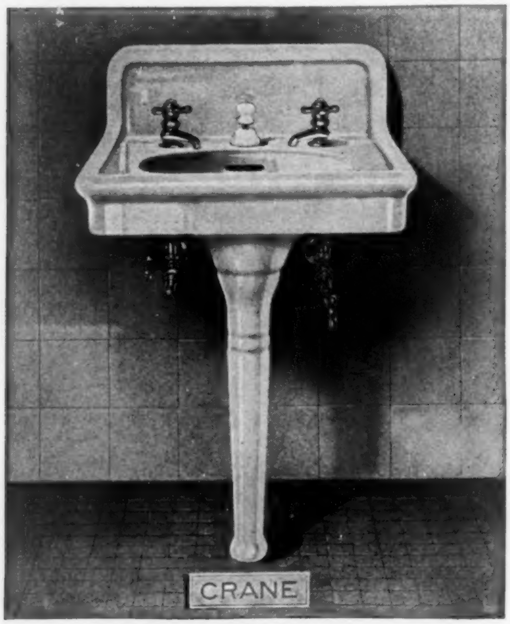
In spite of careful buying, school boards occasionally fail to attain the utmost in service from the plumbing and heating systems they install.

As school practice has advanced, Crane engineers and designers have kept pace with its progress. They have developed and refined fixtures and appliances to meet growing requirements. They have sought opportunities to increase the comfort of students and staff; to protect their health and raise their living standards.

In this work Crane Co. has been aided by the first hand experience it has gained through planning and installing satisfactory systems in countless schools and universities throughout the country. Thus the Crane line of plumbing and heating materials for school use has grown until it covers special as well as regular requirements, with materials that not only give the ultimate in satisfaction and convenience, but assure low installation and upkeep costs as well.

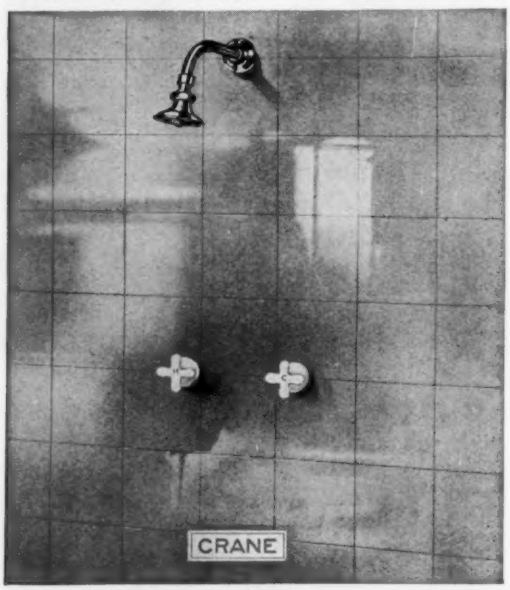
C 9034 A

A concealed regulating screw governs the flow of this "Tyron" Pedestal Drinking Fountain so that the bubbler cannot squirt. The dignity of its simple lines gives this fixture an unusually striking appearance, while its body and well are of that twice-fired vitreous china that is at once so difficult to mar and so easy to keep clean.



C 500-S8

It takes exactly seven seconds to clear the bowl of this "Vernon" Lavatory. Surely a boon for schools. This means an end to dirty water standing in wash bowls (and of dirty bowls, too). The "Vernon" is of twice-fired vitreous china.

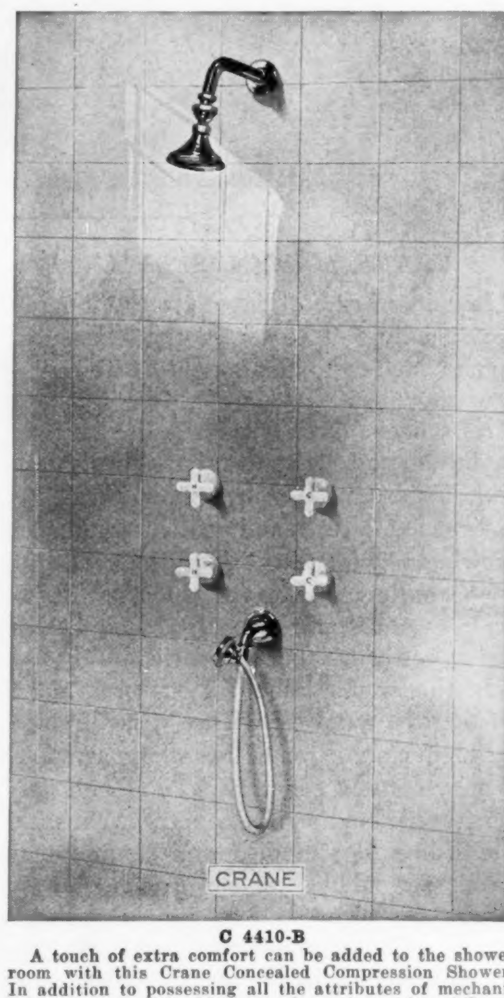


C 4400B

To fulfill its real purpose a shower must perform efficiently. The flow must be even, the water easily tempered. Such a fixture is this Crane Concealed Compression Shower. In addition, it has these advantages: working parts are protected by the wall; outside metal is of chromium or nickel-plated brass; spray can be adjusted to any angle; and valves can be rewashered from the face of the wall. The china soap dish is extra.

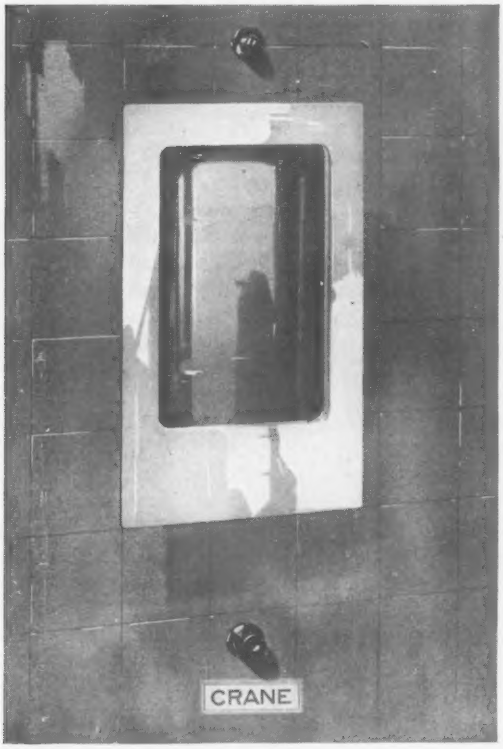
C 800-P 13

Economical to install, and long lasting, is this Crane "Chelsea" Lavatory of twice-fired vitreous china. It is quick in operation, for the faucets are of the "Agilis" quick compression type with renewable seats, and index china lever handles. The open waste strainer is of cast brass. The exposed parts are of chromium or nickel-plated brass.



C 4410-B

A touch of extra comfort can be added to the shower room with this Crane Concealed Compression Shower. In addition to possessing all the attributes of mechanical perfection with which experience has endowed Crane products, its four arm index all china handles permit nicer tempering of the flow, while the shampoo hose connection of reinforced rubber brings a new convenience.

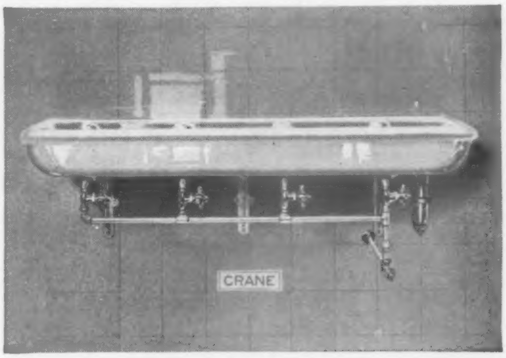


C 9806

Instead of the usual receptacles, that are not only unsightly but a menace to health as well, Crane engineers suggest this "Y. M. C. A." Cuspidor. Recessed in the wall, it is pleasing to the eye. A fan flush maintains constant sanitation, while the fixture itself, of twice-fired vitreous china can be made spotless by the touch of a damp cloth.

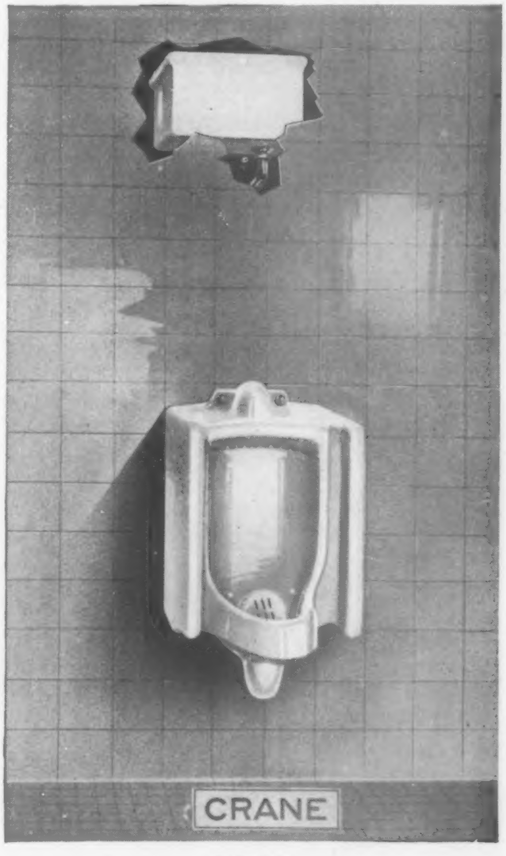
C 10050

A school must do more than maintain systems which are sanitary. It must, by example, inculcate reticence and clean habits. For the impressionable minds of young students quickly take color from their surroundings. This "Walsyn" Syphon Jet Closet fulfills in every way these requirements. It is of strain-resisting, dirt-shedding vitreous china. Its flush is quiet and powerful. It is so sturdy that after years of use it retains its striking appearance.



C 9330 A

The rush from classrooms to the drinking fountain will not jam the hall if you have this "Almo" Multiple Drinking Fountain. It is made to operate many "Non-Squirt" bubblers simultaneously. In its design, particular attention has been given to two features, cleanliness and sturdiness. No dirt can collect on its roll rim, or in its porcelain trough, while its porcelain-enameled body resists both use and abuse.



C 15604

Crane "Correcto" twice-fired vitreous china wall pattern urinal with extended shield. Concealed twice-fired vitreous china automatic urinal tank. Supply tube with hush valve, and brass knee brackets. Exposed metal is of chromium or nickle-plated finish.

AUSTRAL WINDOW COMPANY

101 Park Avenue, NEW YORK, N. Y.

The AUSTRAL WINDOW affords a perfect system of ventilation, without direct draft—without expensive or complicated equipment or operating costs. Even though other systems of ventilation are installed, the AUSTRAL WINDOW may be relied upon to furnish adequate ventilation during the greater part of the school period.

Light is regulated and controlled by the arrangement of Shades on Sash. Free circulation of air is not obstructed. An ideal awning effect is produced without the usual expense and inconvenience.

The Upper and Lower Sash are both reversible for Cleaning and Glazing—a great saving in labor.

Heavy Sash operate as easily as a well-hung door and openings may be regulated as desired. This feature is an AUSTRAL characteristic.

Additional light space is secured by the use of AUSTRAL Plank Frames.

AUSTRAL Mullions are about one-half the size of mullions required for double-hung windows.

AUSTRAL BALANCE ARMS eliminate the use of box frames, chains, weights and pulleys.

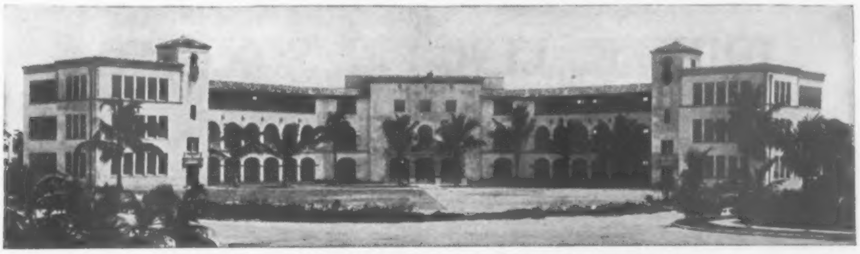
AUSTRAL WINDOWS are also built of heavy two-point contact steel casement sections which insure perfect weathering, at minimum cost.

Wood AUSTRAL Windows lend themselves readily to Weather-Stripping, and may, without affecting the operation of the Sash in the slightest degree, be made tighter than the ordinary double-hung window, weather-stripped.

Details, specifications and full particulars are contained in our School Catalogues which will be sent upon request.

On the opposite page appear representative schools by eminent architects who have adopted the AUSTRAL Window as **"Standard School Equipment."**

Showing a group of AUSTRAL WINDOWS installed in a Kindergarten at Worcester, Mass. Although these windows appear to be closed, they are, as a matter of fact, open from 12 to 15 inches at the center, deflecting the incoming air up into the center of the room, giving perfect ventilation with no danger of draft.

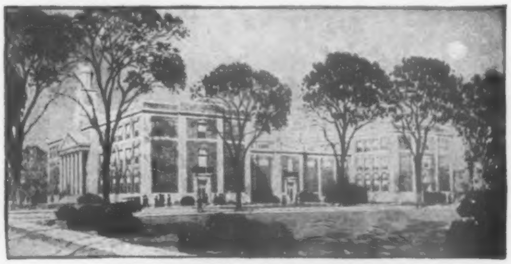


SHENANDOAH JUNIOR HIGH SCHOOL, MIAMI, FLA.
August Geiger, Architect

HIGH SCHOOL, FARGO, N. D.
William B. Ittner, Architect

NATHANIEL HAWTHORNE HIGH SCHOOL, YONKERS, N. Y.
G. Howard Chamberlin, Architect

TUSCAN SCHOOL, MAPLEWOOD, N. J.
Guilbert & Betelle, Architects



HIGH SCHOOL, RUTLAND, VT.
Tooker & Marsh, Architects

LYONS TOWNSHIP HIGH SCHOOL, LA GRANGE, ILL.
Joseph C. Llewellyn & Co., Architects

CENTRAL HIGH SCHOOL DISTRICTS 5, 16, 17, 22, LONG ISLAND, N. Y.
Knappe & Morris, Architects

SENIOR HIGH SCHOOL FOR GIRLS, ATLANTA, GA.
Edwards & Sayward, Architects

CONTINUOUS TAPERED FLAGPOLES

Especially designed for memorials, monuments and buildings of exceptional architectural value. Continuous Tapered Flagpoles are of an entirely different construction from the swaged sectional poles and are more costly. These poles are produced in either steel or bronze and may be tapered conically or with entasis. They have a smooth uninterrupted exterior surface throughout without visible joints or offsets and resemble in contour the obsolete wood flagpoles. Continuous Tapered Poles are not carried in stock and are made to order only. The lower one-third of the visible height of these poles is cylindrical, the diameter of which corresponds to a standard pipe size and the tapered section is confined to the remaining visible height. When poles of this type are used as flagpole monuments or memorials the Architect of the project usually designs a special bronze base and special stone work. We gladly offer our services to Architects by assisting them in properly designing the necessary foundation so that no damage may result from vibration, water or by the water freezing. Continuous Tapered Flagpoles, regardless of length, are usually shipped in one piece each, without field joints, but where shipping and handling will not permit the poles are shipped in two sections each and assembled at the erection site by means of a special field joint. This assembling, however, cannot be accomplished by inexperienced men and we will not ship Continuous Tapered poles in sections unless the assembling in the field is accomplished by our own men. This tends to enhance the cost slightly but insures the purchaser a first class installation which might be marred through the neglect and inexperience of others doing this work.

Further information regarding Continuous Tapered Flagpoles will be mailed to those interested upon application.

INSTALLATIONS

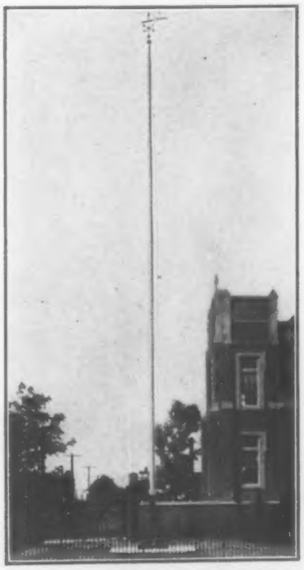
University of Kansas Stadium, Lawrence, Kansas
University of Michigan Museum, Ann Arbor, Michigan
University of North Carolina Stadium, Chapel Hill, N. C.
Mercersburg Academy, Mercersburg, Pa.
Font Bonne College, St. Louis, Mo.
Luther College Gymnasium, Decorah, Iowa
University of Rochester Hospital, Rochester, N. Y.
Concordia Teachers College, River Forest, Ill.
State Normal School, Salisbury, Md.
School of Mines, Rapid City, South Dakota
Philadelphia Public Schools (over 185 installations)

CATALOG

Our General Catalog and Architects' Guide containing full information regarding our flagpole products gladly mailed upon request.

90 X 99-FT. HEAVY PATTERN SWAGED SECTIONAL FLAGPOLE

One of the 185 manufactured and erected for the Philadelphia School Board.



60-FT. ABOVE GRADE CONTINUOUS TAPERED POLE

7⅝-in. butt x 3½-in. top. Parochial School, Riverside, N. J.

80-FT OVER-ALL CONTINUOUS TAPERED POLE

14-in. butt x 5-in. top. Massachusetts Mutual Life Insurance Building, Springfield, Mass.

PEERLESS UNIT VENTILATION CO., INC.

BRIDGEPORT, CONNECTICUT

BOSTON, 80 Boylston Street
NEW YORK, 369 Lexington Avenue
SCOTIA, N. Y., 25 Wallace Avenue
HARRISBURG, PA., 3603 Sharon Street
CLEVELAND, 1836 Euclid Avenue
MINNEAPOLIS, 603 Washington Avenue
SPRINGFIELD, MASS., 19 Edward Street
WARREN POINT, Bergen County, N. J.
BUFFALO, 135 University Avenue
BALTIMORE, 204 Water Street
DETROIT, 1214 Lafayette Building
OKLAHOMA CITY, Frank Loeffler Supply Co.
PORTLAND, ORE., 927 Board of Trade Building

PEERVENT

UNIT SYSTEM

Of Heating and Ventilating

The PeerVent System of heating and ventilating consists of a series of units—usually one unit for each room to be served—which draw in fresh air from outdoors, heat it to any required temperature, and deliver it in such a way that perfect diffusion is obtained without drafts and without the slightest noise.

HOW IT OPERATES

Fresh air is drawn in through an opening in the back of the unit, usually near the floor, by two multi-blade fans, which are operated by a small electric motor at comparatively slow speed. The outdoor air is driven upward by the fans through a special copper radiator. This radiator is so efficient that it will heat the incoming fresh air from a very low outdoor temperature to whatever degree is desirable for the particular room being served. The warmed fresh air passes out of the unit vertically through a grill at the top, at considerable velocity, and so directed that it is thoroughly diffused throughout the room. Seats placed close to a PeerVent Unit are not uncomfortably warm, as they are when placed close to ordinary radiators. There are neither cold drafts nor blasts of too-warm air in any part of the room.

TEMPERATURE CONTROL

Control of room temperature is secured by means of a mixing damper situated between the fans and the radiator. This damper can be adjusted forward and backward, under hand or automatic control, in such a way that the incoming cold air is either all passed through the radiator, or all by-passed around the radiator, or partly through and partly around it, the heated and unheated air being thoroughly mixed as the air leaves the unit. The mixing damper has nothing whatever to do with the volume of incoming fresh air. This volume is constant, as predetermined by the requirements of the room.

RECIRCULATION

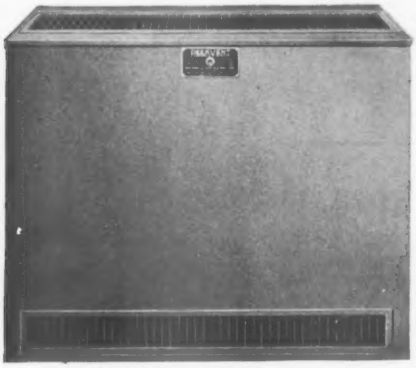
In order to heat an unoccupied room quickly after periods during which no steam has been supplied to the radiators, with the least possible expenditure of fuel and in the quickest possible time, it is possible to shut off entirely the flow of air from outdoors and to recirculate the air in the room. This is accomplished in the PeerVent Unit by means of a single damper. The motor and fans need not be operated while the room is unoccupied, unless it is necessary to increase the temperature by means of recirculation.

AUTOMATIC CONTROL

Automatic temperature control of the PeerVent Unit can be provided by means of a thermostat, which operates the mixing damper. Pneumatic control of the combination fresh-air and recirculation damper can also be provided, so that ventilation of each room in the building can be started and stopped from a central point in the basement or elsewhere.

The fresh-air damper also can be controlled automatically. A simple automatic device permits the machine to recirculate the air in the room when starting in the morning, until the room temperature reaches 65 degrees (or any other predetermined point within a range of 15 degrees). At this temperature the fresh-air intake damper will open automatically, thus stopping recirculation, and the machine will continue to deliver its rated volume of ventilation as long as the room temperature is normal. If the room temperature at any time should fall below 65 degrees, the fresh-air intake damper is closed automatically and remains closed until the temperature again reaches 65 degrees. This control is so designed that when the unit motor stops, the fresh-air intake damper is automatically closed, making it impossible for cold air to enter the room through the unit during periods of vacancy or at other times when the unit motor is not running.

TYPICAL CLASSROOM INSTALLATION



STANDARD PEERVENT HEATING AND VENTILATING UNIT

ADVANTAGES OF THE PEERVENT SYSTEM

Each PeerVent Unit is entirely independent. The cost of running it depends upon actual service rendered in the one room which it serves, regardless of any other room in the building. The system has ample flexibility to meet changing weather conditions, changes in the direction and velocity of the wind, and other variable conditions.

All expense for ventilating unoccupied rooms is eliminated. If one or a few rooms are needed after school hours, they can be heated and ventilated without waste. An open window in a single room cannot disrupt the entire heating and ventilating system throughout the building, as in the case of a central system.

Quiet operation has always been a characteristic of the PeerVent System. The latest Units have improved fans which can be run slower than formerly for a given volume of air. This and other improvements make the modern PeerVent Unit absolutely silent in operation.

There are no bulky or complicated mechanisms in connection with the PeerVent System. The unit itself is extremely simple in construction, and there are no parts that are likely to wear and cause trouble in the course of long service.

The unit system requires no apparatus room in the basement, and no built-in or sheet-metal heat flues, thus saving much space for more advantageous uses or saving excavation if the additional floor space in the basement is not needed. Much expensive ceiling construction is eliminated, permitting reduced story heights and enormous savings in the building construction costs. The unit system also eliminates heat duct losses.

The PeerVent System costs less to install and operate, as compared with a central fan system. It is easy to plan and lay out, and no special provision for ventilation need be made in the building design, excepting the small air inlet openings. When additional units are added to an existing building, PeerVent Units can be installed in the new rooms as required. The PeerVent System can also be installed in an old building, as readily as in a new one.

Various combinations of hand and automatic control are available. All dampers can be hand-operated, or all of them can be operated automatically, or combinations of hand and automatic control can be used.

LATEST IMPROVEMENTS

All important unit features have been improved in the latest PeerVent machines, including the radiator, motor, fans, and controls. The radiator is especially well made, having unequaled thermal efficiency and the strength necessary to insure trouble-free service. The unit is remarkably compact—only 36 inches high and 14 inches deep, the width varying with the capacity of the unit.

All parts of the Peervent Unit are easily removable without tools.

SERVICE BACKED BY EXPERIENCE

The Peerless Unit Ventilation Company was the pioneer manufacturer of heating and ventilating units. Peerless Units installed eighteen years ago are still in service and giving perfect satisfaction. The Company is prepared to furnish expert engineering advice in connection with every installation, to insure permanently satisfactory service.

PEERVENT UNIT WITH FRONT REMOVED, SHOWING FANS (1), AIR FILTER (2), AND RADIATOR (3)

A catalog will be sent on request. Detailed drawings of the units, and tables of engineering data, will be found in Sweet's Architectural Catalog. Any special information will gladly be furnished by any of the offices listed above, on request.

JOSEPH A. VOGEL COMPANY

WILMINGTON, DELAWARE ST. LOUIS, MISSOURI

CLOSETS THAT FLUSH AUTOMATICALLY

VOGEL Number Ten SELFLUSH Seat-Action Closet Combination was designed especially for school use.

It eliminates entirely the necessity for hand operation in flushing. Children are often careless about such things.

The Number Ten SELFLUSH operates every time with a full flow of water, propelled by air pressure which is built up when the water flows into the tank before flushing.

The Number Ten SELFLUSH is the latest development in closet combinations. It is the VOGEL product which has behind it our entire 20 years of experience in making automatic-flushing closets.

The valve of the Number Ten SELFLUSH is extremely simple in its construction. It has few moving parts and these are made of high-tension bronze. All other parts are made of good heavy brass. The washers are made to our own specifications. So particular are we in the making of the Number Ten SELFLUSH that we, in our own plant, wind and temper the springs used in the valve mechanism.

VOGEL NUMBER TEN SELFLUSH COMBINATION DESIGNED FOR USE IN INSTITUTIONS AND SCHOOLS

VOGEL
PATENTED

Number Ten SELFLUSH

Once installed the Number Ten **SELFLUSH** requires no further attention except the renewing of washers after years of use. However, should any adjustment become necessary, the valve stem can be removed in a minute.

There is no complicated piping arrangement in connection with the Number Ten **SELFLUSH**. The Valve and Bowl of the **SELFLUSH** are bolted together in such a way as to make a leak practically impossible. A reinforced shelf at the back of the bowl is provided for making this connection.

The bowl of the Number Ten **SELFLUSH** is heavy vitreous china, finished in a flawless glaze. It is amply large and is designed to expose a minimum of soiling surface.

The seat of the Number Ten **SELFLUSH** is true-grained, air-seasoned oak, finished with a high gloss varnish. This helps to make it easy to keep the Number Ten **SELFLUSH** always spick and span. Indestructible rubber composition seat can be supplied when specified. Tank comes regularly galvanized iron, but at small additional cost can be furnished in lacquer enamel finish and practically any color desired.

The Number Ten **SELFLUSH** is practically a frost-proof closet. However, it should be remembered that so long as water remains in the trap, no outfit is frost-proof.

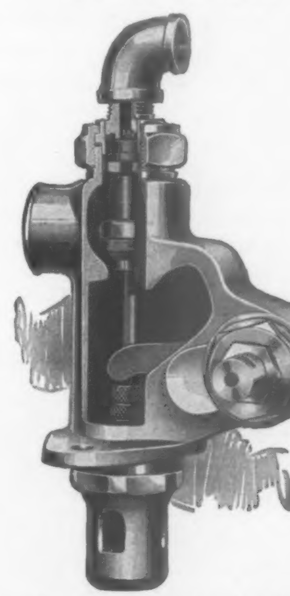
A SEAT-ACTION CLOSET COMBINATION

DESIGNED FOR SCHOOLS AND INSTITUTIONS

VOGEL Closets that are absolutely frost-proof can be supplied where necessary.

Indestructible enameled iron bowls can also be furnished as a part of **VOGEL** Seat-Action combinations, when desired.

THE SEAT OF THE VOGEL NUMBER TEN IS AIR-SEASONED HARDWOOD
Indestructible hard rubber composition seat can be supplied where desired



On a test this valve (above) taken from a VOGEL Number Ten was opened and closed 150,000 times—and didn't show a sign of wear

Folders illustrating the **VOGEL** Number Ten **SELFLUSH** Closet and other Vogel Products, including Vogel Frost-Proof Hydrants for school yards, will be sent promptly.

ALBERENE STONE COMPANY

Quarriers and Fabricators of Alberene Stone

Main Office: 153 West 23rd Street, NEW YORK

Quarries and Mills at Schuyler, Va.

BRANCHES

Boston	Philadelphia	Pittsburgh	Chicago
Newark, N. J.	Richmond, Va.	Cleveland	Washington, D. C.

PRODUCTS (see also page 368)

Alberene Stone, a natural quarried stone, fabricated for the following purposes in school construction:

Stair Treads and Landings	Toilet Partitions
Door and Window Sills	Urinals
Plinths, Trim, Wainscot	Shower Compartments
Spandrels	Shower Dressing Rooms
	Flooring and Base

PHYSICAL CHARACTERISTICS

Alberene is a natural quarried stone, blue-gray in color, non-stratified and free from cleavage lines, dense, uniform in texture and color, practically non-absorbent and non-staining, easily cleaned, flame resistant and fireproof. It is easily machined—tongued, grooved, slotted, bored or turned—without splitting or spalling.

SANITARY WORK

The outstanding superiorities of Alberene for toilets, urinals and showers are: (a), its non-absorbent, non-staining, easily cleanable qualities; (b), its easy fabrication by means of tongue-and-groove, bolted-and-cemented joints, in structures that are impervious and 100% sanitary; (c), its non-spalling, non-chipping surface.

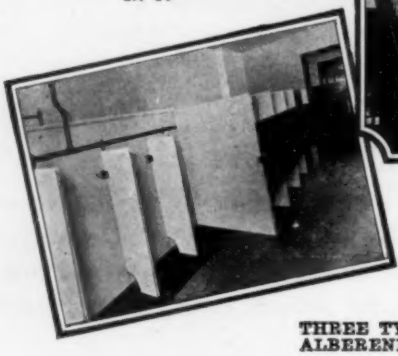
STAIR TREADS AND LANDINGS

A special grade of hard Alberene selected for these purposes has a "toothed" surface which never wears away and which is always non-slipping under all conditions. Its wearing qualities also are excellent, and it is absolutely fireproof.

THE MATTER OF "LIFE"

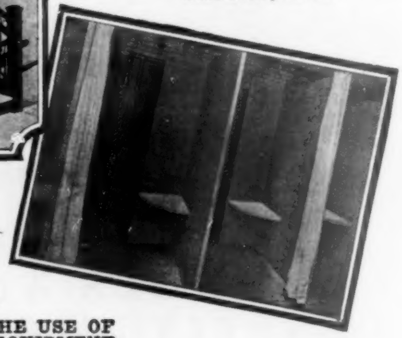
The limit of useful "life" of Alberene Stone has not yet been revealed in an experience of over 40 years. Barring accident, the moderate first cost of Alberene Stone equipment is the one and only cost—there are no after-costs.

TOILETS AND URINALS
HIGH SCHOOL, MONTCLAIR, N. J.



STAIR TREADS AND LANDINGS
HIGH SCHOOL, SOMERVILLE, N. J.

SHOWERS AND DRESSING ROOMS
MEMORIAL SCHOOL NO. 11, PASSAIC, N. J.



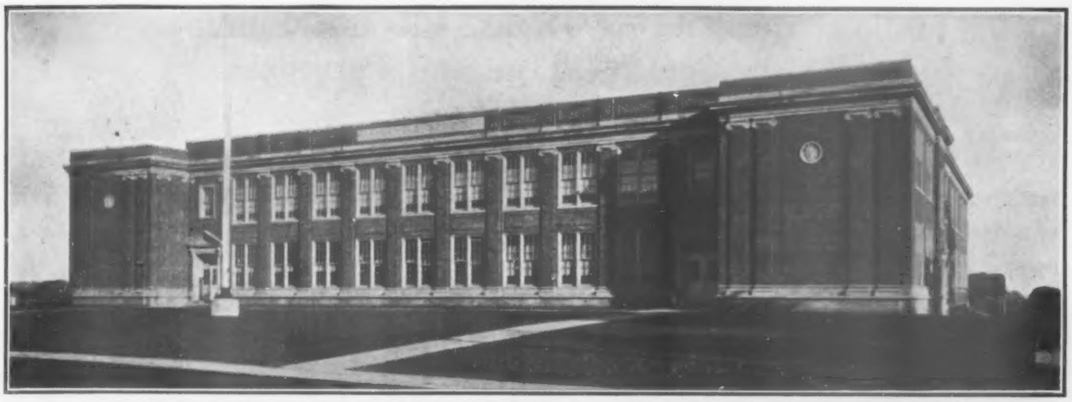
THREE TYPICAL EXAMPLES OF THE USE OF ALBERENE STONE IN SCHOOL EQUIPMENT

THE BARRETT COMPANY

Manufacturers of Roofing Materials

NEW YORK, N. Y.

BIRMINGHAM, ALA. BOSTON, MASS. CHICAGO, ILL. MINNEAPOLIS, MINN. PHILADELPHIA, PA. KANSAS CITY, MO.
THE BARRETT COMPANY, LIMITED, MONTREAL, P. Q.



A BARRETT SPECIFICATION ROOF PROTECTS THE SCHUYLER SCHOOL, KEARNY, N. J.
Architects: Guilbert & Betelle, Newark, N. J., Contractors: F. & C. Haerter, West New York, N. J.

PRODUCTS

Roofing Materials for flat surfaces—Barrett Specification Pitch and Barrett Specification Felt, Black Diamond Pitch and Black Diamond Felt. For detailed specifications see Vol. I, Barrett Architects' and Engineers' Built-Up Roofing Reference Series.

For Steep surfaces—Barrett Specification Felt, Barrett Specification Pitch, Anchor Asphalt and S. I. S. Roofing. For detailed specifications see Vol. II, Barrett Architects' and Engineers' Built-Up Roofing Reference Series.

Flashings—For brick and concrete walls. See Vol. III, Architects' and Engineers' Built-Up Roofing Reference Series.

Roof Leader and Roof Vent Connections—See Vol. IV, Barrett Architects' and Engineers' Built-Up Roofing Reference Series.

Miscellaneous Waterproofing—For foundations, swimming pools, tunnels, floors, etc., special specifications submitted. **Insulating and Building Papers:** For sheathing, lining, etc. **Damp-proofing and Preservative Paints, Wood Preservatives. Tarvia:** For playground surfacing, paths and roadways.

AMERICA'S BEST-KNOWN ROOF—THE BARRETT SPECIFICATION

The thousands of America's finest schools protected by Barrett Specification Roofs constitute an impressive demonstration of value. Architects favor Barrett Specification construction because they know that these roofs will outlast an ordinary roof—that they will long outlive the 20-year period for which they are bonded against repair and maintenance expense by a national bonding company. (There is also a Specification Type "A" Roof which is bonded for 10 years.)

Barrett Specification Roofs carry Class A—base rating—by the National Board of Fire Underwriters. The slag or gravel surface is immune to flying sparks, and the roof itself possesses the necessary tensile strength to be self-supporting in extreme emergency. **No roof-covering retards fire to a greater degree than a Barrett Specification Roof.**

Barrett Approved Roofers, each one selected for his experience, ability and integrity, apply Barrett Specification Roofs and offer the complete Barrett Roofing Service.

BARRETT FREE ROOF INSPECTION SERVICE

On request one of our inspectors will make a careful survey of your roof, flashings, walls, coping, etc. This service is available for buildings with roof areas of 5,000 square feet or more that are located east of the Rockies. Address Barrett Roof Examination Service, The Barrett Company, 40 Rector Street, New York, N. Y. In Canada, write to The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, P. Q.

Barrett Specification Roofs
TRADE-MARK

DAHLSTROM METALLIC DOOR COMPANY

Established 1904

427 Buffalo Street, JAMESTOWN, N. Y.

New York Chicago Los Angeles Detroit Dallas
Philadelphia Cleveland

Makers of

Hollow Metal Swing Doors, Elevator Entrances, Smoke Screens, Trim and Partitions

Those products of such an outstanding reputation as to be the accepted standard of value for an industry—require more than mere factory facilities to produce. To known excellence of design, workmanship and material must be added the forward looking co-operation of a modern minded organization—that the finished product will reflect the modern spirit in the years to come . . . will never become antiquated. In the modern School Construction, "Doors, Trim and Smoke Screens by Dahlstrom" mean added years of wear, attractiveness that is never outmoded, value . . . unequaled. Further, the famed Dahlstrom Hollow Metal Fireproof Construction . . . materially increases the safety factor. Plates of recent Dahlstrom installations are available to those interested.

TYPICAL DAHLSTROM SMOKE SCREEN INSTALLED IN THE JACKSON SCHOOL, OHAMA, NEBRASKA

METAL SWING DOORS SHOWN WERE INSTALLED IN THE CHRISTOPHER COLUMBUS SCHOOL, BINGHAMPTON, N. Y.

"No building is more fireproof than its doors and trim."—Dahlstrom.

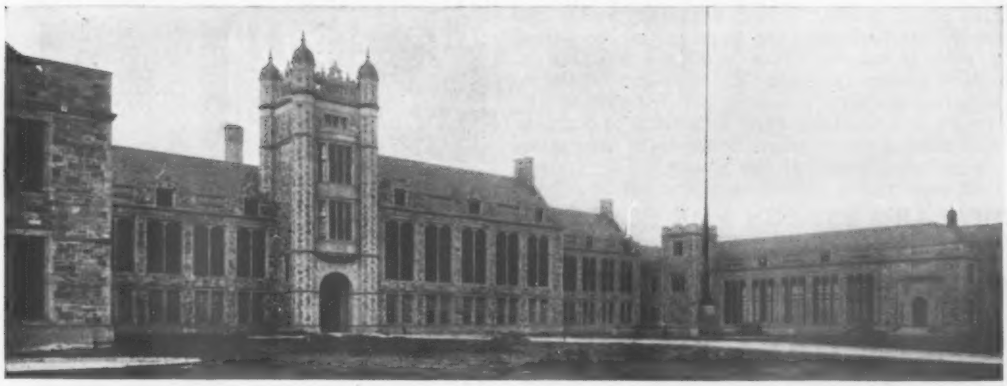
THE DETROIT STEEL PRODUCTS COMPANY

2250 East Grand Boulevard, DETROIT, MICHIGAN

FACTORIES: Detroit, Michigan, and Oakland, California

Fenestra

STEEL WINDOWS



Architect
H. J. KEOUGH

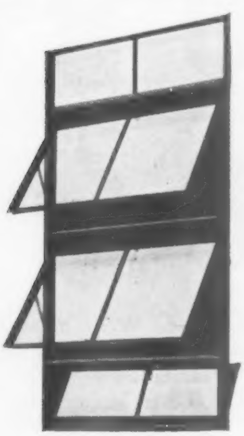
THE FORDSON HIGH SCHOOL
Dearborn, Mich.

Contractor
F. R. PATTERSON CONSTR. CO.

Modern design, modern construction, modern materials are all to be found in the new schools being built today.

For instance, note the number of these schools that are using Fenestra School Windows of solid steel. They're new in design—fire resistant—with narrow bars and small glass lights, admitting a flood of daylight—with easily operated ventilators that welcome the pleasant weather—yet close snugtight when necessary.

And these better steel windows are easily washed — every square inch of outside glass can be reached from within — easily shaded — and economical, too, for their small panes when broken can be easily replaced. They have both modern convenience and architectural beauty — they are in full accord with modern school designing.

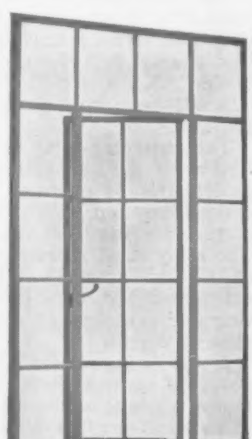


THE SCHOOL WINDOW

Some architects, some school boards, prefer the Fenestra Casement Windows. Built with sash and frame complete, accurately adjusted and fitted at the factory, equipped with well-designed hardware, weather-tight, operating on extension hinges with bronze bushings that make it possible to open or close the windows with a finger's touch; they are in harmony with the architecture of any period or style.

Fenestra Casement Windows are made in many stock sizes and types, and are carried in warehouses all over the country. This enables us to give fast, dependable service.

When the design of the new school is under consideration let a Fenestra Engineer give you a demonstration of the different types of Fenestra Windows and the advantages they offer. There is a Fenestra office near you for your convenience.



THE CASEMENT WINDOW

THE GAMEWELL COMPANY

Fire and Police Signaling Systems

NEWTON UPPER FALLS, MASS.

BRANCH OFFICES

Boston, Mass., 1022 Commonwealth Avenue
New York, N. Y., 70 East 45th Street
Atlanta, Ga., Peters Building
San Francisco, Cal., 939 Larkin Street
Chicago, Ill., 176 W. Adams Street
Pittsburgh, Pa., Keenan Building
Dallas, Tex., Praetorian Building
Denver, Colo., 1741 Arapahoe Street
Detroit, Mich., 1125 Pingree Avenue

FIRE ALARM SYSTEMS FOR SCHOOLS AND UNIVERSITIES

Fire alarm protection for schools presents an entirely different problem than for universities. For schools consisting of a single building a standard system is available. It is the Dualarm system, the simplest but most efficient system yet designed. For the university consisting of a group of buildings a survey must be made to determine the particular needs of the group. The system is then engineered according to the survey.

DUALARM SYSTEM FOR SCHOOLHOUSES

A schoolhouse system to be effective should do two things: (1) Empty the school of children. (2) Call the municipal fire department without pulling a separate box. The Dualarm now makes it possible to do both and in addition provides for a local drill signal controlled by the school principal, at a cost that is within reach of the average small school.

Typical Dualarm Specifications

The fire alarm system shall consist of a Gamewell Shunt Type Box with Shunt Pull Stations, to send the alarm to municipal fire headquarters a relay, contactor and vibrating bells (or horns) to sound a local alarm. No local battery is to be used.

The shunt type master box shall be a successive, non-interfering type that will be approved by the official in charge of the municipal fire alarm system. It shall be made so that the operating current for the shunt loop will be provided by the municipal fire alarm system.

The shunt pull station shall be a cast iron case containing a substantial knife switch arranged to keep the circuit normally closed. To operate the box simply pull down the handle and pull the hook. After the pull station has been operated it shall be automatically locked in such open position.

The contactor-relay set shall work in conjunction with the shunt type master box. When a pull station is operated the relay shall trip the master box and simultaneously energize the contactor, ringing the vibrating bells (or horns). The relay shall operate on a minimum line circuit of 65 milliamperes. The contactor shall be rated at 250 volts, 15-ampere intermittent operation and arranged to open both sides of the bell ringing circuit.

A starter button shall be provided for drill purposes to control the pick-up circuit of the contactor in place of the relay. The circuit arrangement shall prevent a drill signal from interfering with the operation of a shunt pull station and the transmission of an alarm to fire headquarters.

Vibrating bells shall be supplied which are provided with 6-in. saucer type bells and capable of being operated by the current supply available.

Horns shall be supplied in place of the vibrating bells, if a distinctive sound is desired for the interior alarm.

The shunt type master box shall be installed inside or outside of the building in a place designated by the official in charge of the municipal system and in a manner satisfactory to him. No. 14 B & S gauge copper wire shall be used for the auxiliary loop. This loop shall be installed in ½-in. rigid conduit with no breaks between the conduit and the boxes or the contactor which would allow the auxiliary loop to be exposed.

ENGINEERING SERVICE

Our Engineering Department is ready at all times to make surveys and lay out systems. This service is based upon more than sixty years' experience in the fire alarm field. Write or wire our home office or any of our branches and information will be furnished promptly.

BULLETINS

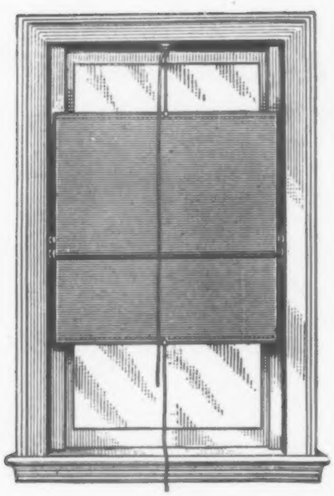
Complete information in bulletin form is available on the Dualarm System and all other forms of protection for the university group.

INTERSTATE SHADE CLOTH CO.

HOBOKEN, NEW JERSEY

THE LAPSLEY-INTERSTATE SHADE CLOTH CO.,
Baltimore, Maryland

INTER-TWILL
WINDOW
SHADES
WILL OUTWEAR THEM ALL
THE STRENGTH IS IN THE TWILL



DOUBLE HUNG WINDOW SHADE INSTALLATION

Two window shades are installed at center of window. One shade may be pulled up to cover upper sash, the other shade pulled down to cover lower sash. Double hung window shade installation is especially suitable for schools, since it permits control of light and ventilation.

"INTER-TWILL"—THE LONG WEARING SHADE CLOTH

An improved type of shade cloth with the strength in the twill. We believe it is the toughest and strongest shade cloth and will out-wear them all. It will stand abuse and rough usage. The threads will not "burn" when exposed to the sun's rays. It has special Interstate protective coating which makes it easily cleanable, reversible and long wearing. Soil is easily removed from its surface. The manner in which the twill fabric is woven insures the extra years of service. It is pure finished, and unfilled, no clay or other fillings used in the manufacture. Made in any color tone and in any combination of colors.

To darken auditorium—if total exclusion of light is desired, specify "LITE-PROOF" Shade Cloth. Shadowless and Light proof in all colors including light colors and white.

Also: Silver Screens for motion pictures.

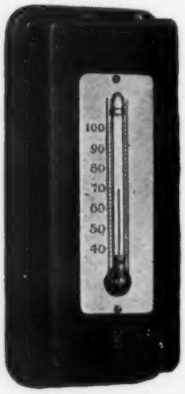
JOHNSON SERVICE COMPANY

Temperature Regulation and Humidity Control

MILWAUKEE, WISCONSIN

BRANCHES IN ALL LARGE CITIES OF THE U. S. AND DOMINION OF CANADA

THE JOHNSON SERVICE COMPANY are manufacturers and contractors for the **Johnson** System of Temperature and Humidity Control. As such, it has been furnishing and installing temperature regulating apparatus in schoolhouses for forty years. It is the original and leading Company in that line of business in the U. S. and the system is generally adopted as a standard. It has equipped schoolhouses and buildings of universities and colleges in every city in the Union and the installations number in the thousands. The Company manufactures apparatus applicable to every known kind of heating and ventilating and its large and varied experience enables it to provide the proper apparatus for every case in the most efficient manner. Steam blast, furnace blast, direct steam or hot water, split system or any form of unit ventilating systems are equally and efficiently controlled.



JOHNSON ROOM OR WALL THERMOSTATS

The **Johnson** Room or Wall Thermostat, called the "Model Thermostat," is 5 inches high, 2 inches wide and 1¼ inch deep and a most efficient thermostat. It is constructed entirely of metal and operates the valves and dampers to which it is attached with an actual graduated motion so as to hold the valves partially open or partially closed in such manner as to maintain the degree of temperature required.

JOHNSON DUAL THERMOSTAT

The **Johnson** Dual, or two-temperature thermostat, is also a room or wall thermostat, but is arranged so that it will provide either a daytime temperature, usually 70 degrees, or a night-time temperature of any lower degree for all or some of the rooms of the building by the manipulation of a switch by the engineer or other person in authority. It is a factor for the greatest economy in school buildings, a number of the rooms of which are occupied at night as well as day.

SYLPHON VALVES

The valves furnished in connection with the **Johnson** system of temperature control are all metal valves—the metal diaphragm of which is the celebrated seamless "Sylphon" metal bellows. Fifteen years of use as a diaphragm in valves has proved its durability and superiority.

SERVICE

The **Johnson Service Company** maintains main branch offices in twenty-six cities of the U. S. and fifteen sub-offices from which service is rendered to the various plants in adjacent territories.

All apparatus and installations are guaranteed by the Company and periodic inspections of the plants are made free of charge.

H. W. KEEBLER MANUFACTURING CO.

422 First Avenue, PITTSBURGH, PA.

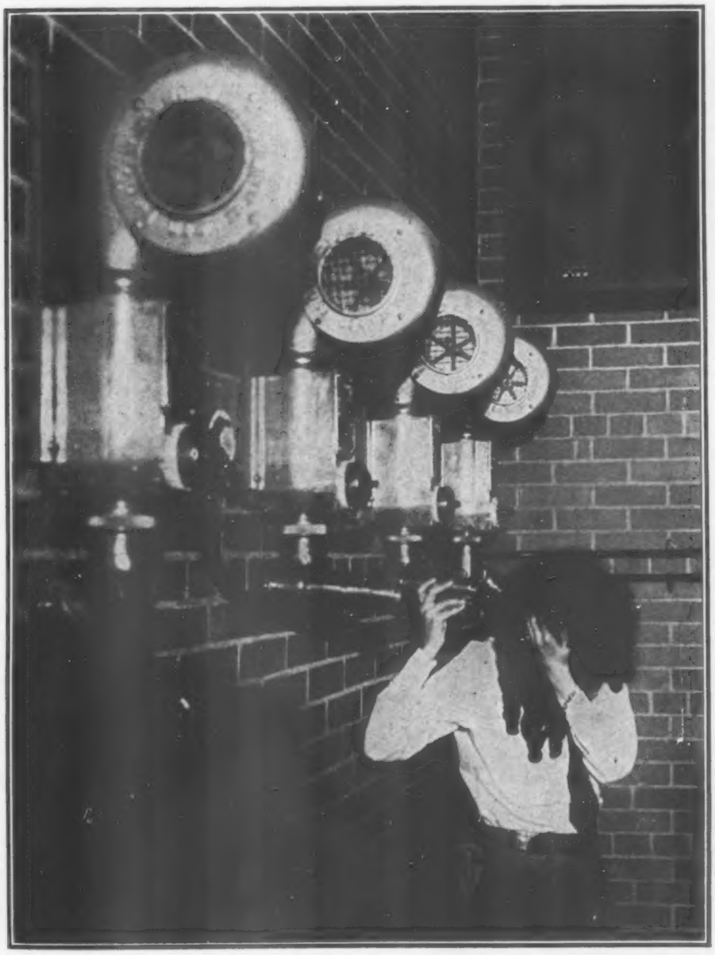
R. B. SANITARY ELECTRIC DRYER

The R. B. Sanitary Dryer is designed to replace the always expensive and sometimes unsanitary towel in swimming pools for schools and other institutions.

The process is natural and thorough. A current of filtered air passes through a compartment supplied with an electric heater. The heated air is then passed through a bell mouth opening to the hair or body, and the water is soon completely evaporated, leaving a feeling of exhilaration and cleanliness not experienced when a series of more or less damp towels is used.

The skin is dry, the pores are closed, and the full benefit of the bath is experienced without the likelihood of catching cold.

When used for hair-drying, the machine thoroughly dries the hair. Girls and women often forego swimming-pool privileges for fear of catching cold from imperfect drying of their hair. The R. B. method is the **safe** method of hair-drying, especially in cold weather.



ECONOMY

While sanitation — the protection of health—is the first consideration, nevertheless operating cost is important. The investment in towels required for a large school swimming pool amounts to a considerable sum of money originally, but the maintenance and replacement costs constitute a continuous, never-ending expense.

If, then, you can give your students a more sanitary, safer system, and at the same time save a large part of the operating cost of towels, you are helping both the students and the school budget.

Sixty of these machines have been installed in pools of the public schools of Pittsburgh.

The R. B. Dryer is made in several standard sizes, in complete portable units, and will be built to order for large installations.

Write for descriptive circular

KERNER INCINERATOR COMPANY

637 East Water Street
MILWAUKEE, WISCONSIN

BRANCH OFFICES AND AGENCIES IN OVER 100 CITIES

PRODUCTS

The KERNERATOR CHIMNEY-FED INCINERATOR for the prompt, safe and sanitary disposal of garbage and rubbish of all kinds by burning without cost. Made in various sizes to meet the requirements of small and large schools, colleges, academies, seminaries, and other buildings.

"CONVENIENT HOPPER DOOR SAVES COUNTLESS STEPS"

DESCRIPTION (Refer to Illustration)

The KERNERATOR consists of a brick combustion chamber, with fire brick lining, located in the basement of the building (or built against the outside of the building, where there is no basement or where other conditions require it) into which is built a special arrangement of grates with a patented by-pass flue which provides proper draft control to insure complete, successful, and odorless combustion of garbage from the cafeteria (if there is one) and all promiscuous waste.

One or more receiving hopper doors (shown above) are located in the flue (regular chimney) on the floor or floors above. In schools, hopper doors are usually located in the wall of service rooms, common corridors, or at some other point easily reached on each floor. The flue serves as a fall-way for garbage and waste deposited in the hopper doors, and also as a chimney to carry off the products of combustion during burnings.

SECTIONAL VIEW SHOWING INTERIOR CONSTRUCTION AND OPERATION OF KERNERATOR

Notice the draft reaching the point of burning through by-pass grate. The fire is always on top of the burning material, consuming offensive odors.

KERNERATOR OPERATION

No gas, coal or other commercial fuel is required.

All garbage and waste (sweepings, waste paper, tin cans, broken crockery, bottles, etc.) are placed in the door hoppers. When the doors are closed this refuse falls down the flue into the incinerator combustion chamber where it spreads out on the grates into a more or less separated and loose pile, permitting the constant flow of air up the by-pass to circulate through and around it, causing a surprising amount of evaporation between burnings.

When the combustion chamber is nearly full the refuse is lighted (a match does it) and the whole mass burns without further attention. Due to the by-pass flue combustion is from the top downward and all unpleasant odors are destroyed. The fire feeds upon the waste paper and other combustible material and gradually dries the damp substances so that they also burn to a fine ash. After several burnings the ashes along with cans, bottles and other non-combustible articles, which are thoroughly flame sterilized, are dumped into the ash pit for removal every few months.

PERMANENTLY BUILT IN

The Chimney-fed KERNERATOR, being a built-in unit, is most easily installed while the building is being erected, and should be included in the building plans, when provision can be made for a flue of proper size and conveniently located for placing the hopper doors.

FOR AN EXISTING BUILDING

In considering the installation of the Chimney-fed KERNERATOR for an existing school building, the deciding factor is mainly the question of a flue of sufficient size easily accessible from all points from each floor.

If such a flue exists and basement conditions are favorable, the installation of a Chimney-fed KERNERATOR is a simple matter. In school buildings where a Chimney-fed KERNERATOR cannot be used, the basement-fed KERNERATOR is the ideal installation. This is the same as the Chimney-fed KERNERATOR with the exception that the garbage and waste is deposited through a receiving door in the upper part of the basement combustion chamber.

IMPORTANCE OF THE KERNERATOR FOR SCHOOL BUILDINGS

The centering of education into larger units has increased the importance of the problem of sanitation and safety in the modern school building.

With so many children housed under one roof, provision must be made for the immediate sanitary disposal of promiscuous waste. Statistics show a large percentage of fires due to accumulations of loose waste paper and rubbish in school basements.

The KERNERATOR does away with the expense of buying, cleaning and replacing of garbage cans and rubbish receptacles; the necessity of daily collections of waste paper and sweepings, and removal to the basement; saves the cost of frequent trucking of this material away from the building; and eliminates the dangerous fire hazard of accumulations of this material in school basements. It promotes clean, sanitary and safe conditions throughout. It has solved the problem of waste disposal in a large number of schools, academies, and seminaries throughout the country.

We solicit the opportunity of consulting with you on suitable incinerator equipment after the preliminary sketches of floor plans are completed. A representative in charge of our nearest branch office will gladly call and discuss with architects and school officials, the matter of suitable equipment to fit the exact needs of each job.

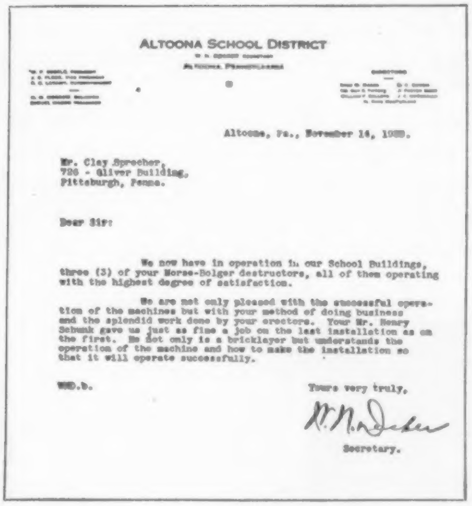
MORSE-BOULGER DESTRUCTOR COMPANY

205 East 42nd Street, NEW YORK, N. Y.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

HEAVY-DUTY INCINERATION

MORSE-BOULGER DESTRUCTORS



ALTOONA SCHOOL DISTRICT

Altoona, Pa., November 14, 19[illegible].

Mr. Clay Sprecher,
726 - Oliver Building,
Pittsburgh, Penna.

Dear Sir:

We now have in operation in our School Buildings, three (3) of your Morse-Bolger destructors, all of them operating with the highest degree of satisfaction.

We are not only pleased with the successful operation of the machines but with your method of doing business and the splendid work done by your erectors. Your Mr. Henry Schunk gave us just as fine a job on the last installation as on the first. He not only is a bricklayer but understands the operation of the machine and how to make the installation so that it will operate successfully.

WND.b.

Yours very truly,

W. N. Decker

Secretary.

for the incineration of all wastes collected in schools and universities.

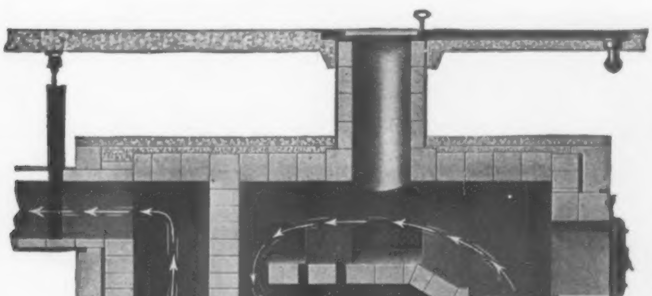
"We now have in operation in our school buildings, three (3) of your Morse-Boulger Destructors, all of them operating with the highest degree of satisfaction."

. . . with the highest degree of satisfaction . . . thus Mr. Decker, Secretary of the Altoona School District, vividly expresses the opinion of the authorities of the schools and universities equipped with Morse-Boulger Destructors for the incineration of all wastes.

Immediate incineration of all refuse on the premises increases sanitation and reduces the fire hazard. There is a standard Morse-Boulger Destructor for every size institution and for every type of refuse from ordinary sweepings and rubbish to wet garbage from kitchen and dining rooms, and animal matter from pathological laboratories and medical school dissecting rooms.

Experience of over a third of a century is applied in the design and construction of Morse-Boulger Destructors. Each installation is constructed for permanence by experienced mechanics, and is guaranteed to render satisfactory service.

Morse-Boulger engineers will analyze your needs and recommend suitable equipment for your requirements.



MORSE-BOULGER DESTRUCTOR FOR GARBAGE AND ANIMAL MATTER

A FEW SCHOOLS AND UNIVERSITIES USING MORSE-BOULGER WASTE DISPOSAL EQUIPMENT

Cornell Medical College, New York, N. Y.
Bellevue Medical College, New York, N. Y.
Iowa State University, Iowa City, Iowa
Jefferson Medical College, Philadelphia, Pa.
Rockefeller Medical Research, New York, N. Y.
University of Michigan, Ann Arbor, Mich.
Union Medical College, Peking, China
Johns-Hopkins Hygiene Bldg., Baltimore, Md.
University of Rochester, Rochester, N. Y.
Johns-Hopkins Hunterian Bldg., Baltimore, Md.
Howard University, Washington, D. C.
University of Pennsylvania, Philadelphia, Pa.
Georgetown Medical School, Washington, D. C.
Women's Seminary, Wheeling, W. Va.
Bellevue Nurses Training School, New York, N. Y.
North Park College, Chicago, Ill.
New Jersey College for Women, New Brunswick, N. J.
St. Charles Seminary, Overbrook, Pa.
Case School, Cleveland, Ohio.
Morgan Park Military Academy, Chicago, Ill.
LaSalle Military Academy, Oakdale, L. I.
Newcomb College, New Orleans, La.
New Castle Jr. High School, New Castle, Pa.
Sarah Lawrence College, Yonkers, N. Y.
Roosevelt High School, Altoona, Pa.
New Senior High School, Altoona, Pa.
Old Senior High School, Altoona, Pa.
Montclair High School, Montclair, N. J.
Seminary of the Immaculate Conception, Huntington, L. I.
White Plains High School, White Plains, N. Y.

THE STANDARD ELECTRIC TIME COMPANY

SPRINGFIELD, MASS.

The Standard Electric Time Co. of Canada, Ltd., 726 St. Felix St., Montreal, P. Q.

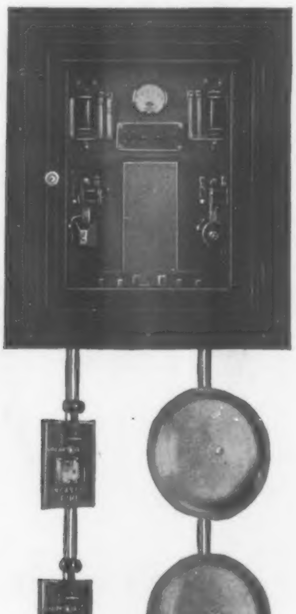
ATLANTA, 204 Glenn Bldg.
BALTIMORE, 2 E. Redwood St.
BIRMINGHAM, 625 S. 18th St.
BOSTON, 10 High St.
BUFFALO, 901 Mutual Life Bldg.
CHARLOTTE, N. C., 217 Latta Arcade
CHICAGO, 1510 Monadnock Bldg.
CLEVELAND, 1333 Union Trust Bldg.
COLUMBUS, O., 83 South High St.
DALLAS, 716 Mercantile Bank Bldg.
DENVER, 562 Penn St.
DETROIT, 806 Donovan Bldg.
KANSAS CITY, MO., Mutual Bldg.
LOS ANGELES, Room 670, 124 W. 4th St.
MINNEAPOLIS, 745 McKnight Bldg.
NEW YORK CITY, 50 Church St.
PHILADELPHIA, 1612 Market St.
PITTSBURGH, Bessemer Bldg.
PORTLAND, ORE., 65 First St.
SAN FRANCISCO, 1 Drumm St.
SCRANTON, 148 Adams Ave.
SEATTLE, 918 Western Ave.
SPOKANE, 110 S. Cedar St.

"STANDARD" FIRE ALARM SYSTEMS

(Approved by Underwriters)

1. **Maximum Protection to Life and Property**
2. **Thorough Reliability**
3. **Simplicity**
4. **Economy in Operation and Maintenance Cost**

These are the qualifications which have made "Standard" fire alarm systems so successful everywhere and the choice of prominent architects, engineers and school officials.



(TYPE FBS)
CLOSED CIRCUIT SYSTEM

CLOSED CIRCUIT SUPERVISED SYSTEM

The Type FBS is a double supervised closed circuit system, arranged so that all circuits including wiring, break-glass stations, gongs, relays, and other apparatus are under constant electrical supervision, and in case of any disarrangement on the system a warning bell will sound. A coded signal is sounded on single-stroke gongs when a break-glass station is operated.

This system is as near fool proof as a fire alarm system can possibly be made,—the last word in school fire alarm equipment.

OPEN CIRCUIT SYSTEM

In cases where our open circuit system is desired without the electrical supervision,

(TYPE 450)
OPEN CIRCUIT SYSTEM

Type 450 is recommended. This operates similar to the closed circuit FBS system except for its open circuit and non-supervision features. Vibrating gongs are recommended as preferable with this type.

Write for Bulletins

See pages 325 and 382 for electric clocks and laboratory equipment.

THE UNION METAL MANUFACTURING CO.

General Office and Factory: CANTON, OHIO

BRANCHES

New York, Chicago; Philadelphia, Cleveland; Atlanta, Boston; Los Angeles, San Francisco; Seattle, Dallas

DISTRIBUTORS

G-E Merchandise Distributors Assn. **Graybar Electric Company, Inc.**

Offices in all Principal Cities

PRODUCTS

Union Metal Pressed Steel Standards and King Ferronite Standards for streets, drives and parkways.

Union Metal Exterior Lighting Fixtures, Entrance Standards, Brackets and Newels for building entrances, gateways and the lighting of grounds.

ADVANTAGES OF UNION METAL LIGHTING EQUIPMENT

Union Metal Pressed Steel Standards have been in use for nearly a quarter of a century. The fluted steel construction provides a clean-cut, classical distinction and artistic beauty which cannot be obtained except in metal standards.

King Ferronite Standards represent the most advanced type of cast metal construction. Ferronite is not to be confused with ordinary cast iron. This material has far greater strength, freedom from impurities and an absence of flaws and defects.

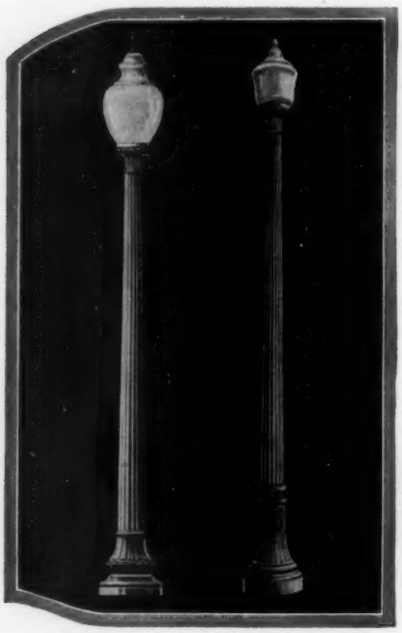
Union Metal has specialized in outdoor lighting for nearly a quarter of a century and has furnished equipment for numerous colleges and universities as well as for monumental "White-Way" lighting.

SAFETY

Only pressed steel and Ferronite are capable of successfully withstanding over a period of years the service to which a lighting standard is put. In case of collision these standards will withstand a greater impact than ordinary construction.

CATALOGUES

Complete catalogues of Union Metal Pressed Steel and King Ferronite standards and Union Metal Exterior Lighting Equipment will be sent on request.

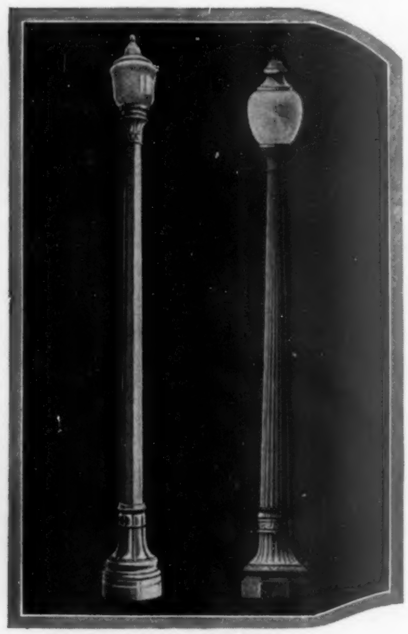


DESIGN NO. 874 Height to light source 10′ 7″.

DESIGN NO. 1571 Height to light source 11′ 8″.

DESIGN NO. 1119

DESIGN NO. 766 Globe 16″ dia.



DESIGN NO. 1082 Height to light source 11′ 6″.

DESIGN NO. 2216 Height to light source 11′ 6″.

WESTINGHOUSE ELECTRIC AND MFG. CO.

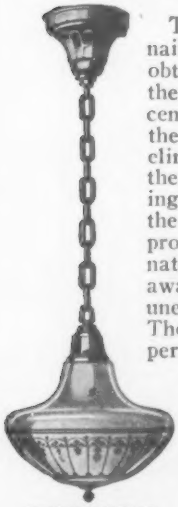
EAST PITTSBURGH, PENNA.

Offices in all principal cities throughout the United States

COMMERCIAL LIGHTING EQUIPMENT

The Westinghouse Electric & Manufacturing Company manufactures lighting equipment suitable for providing the proper distribution of light, free of glare and objectionable shadows, in any installation that is required in the educational institutions. In class rooms, laboratories, shops, offices, libraries and dormitory rooms, correct lighting should be provided.

FOR CLASS ROOMS, LIBRARIES, OFFICES AND DORMITORIES



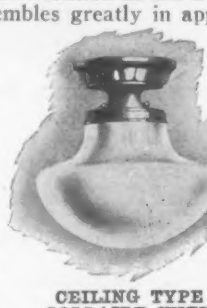
SUSPENSION TYPE SOLLUX LUMINAIRE WITH PANELED HANGER AND DECORATED GLOBE

The Westinghouse Sollux Luminaire is the highest quality luminaire obtainable. The globe contour of the Sollux utilizes the highest percentage of the light generated and the diffusing quality of the glass eliminates all glare. In the Sollux, the keeper ring method of supporting the globe in the hanger makes the globe totally enclosed and dust-proof and bug-proof. It also eliminates unsightly set-screws and does away with globe breakage, due to unequal expansion and contraction. The tilt-out cap, another feature, permits easy replacement of the lamp without removing the globe from its holder.

The Sollux Luminaire is available with ornamental, paneled and plain hangers in both ceiling, suspension and semi-rigid types. Globes are plain and decorated, in sizes from 10 to 18 inches to accommodate lamps for 75 to 500 watts.

The Westinghouse Sollaire Luminaire has practically the same efficiency of light distribution as the Sollux Luminaire which it resembles greatly in appearance.

Certain Sollux features have been eliminated in the Sollaire and a considerable reduction in cost has thus been made possible.



CEILING TYPE SOLLAIRE WITH PLAIN GLOBE

The Sollaire comes plain and paneled hangers for the ceiling type and with chain and semi-rigid hangers for the suspension type. Plain and decorated globes are available in sizes from 8 to 20 inches in diameter for lamps of from 50 to 1000 watts. The Westinghouse Sollite Luminaire offers a more angular globe for those to whom the Sollux and Sollaire globes do not appeal or who wish to use a globe with decoration in the more modern style. The Sollite Luminaire comes in the plain, banded and **art moderne** styles. The diffusing glass used in the globe is of the same efficiency and quality as that used in Sollux and Sollaire Luminaires.

CEILING TYPE SOLLITE

The simplified mechanical construction of the Sollite allows it to be offered at a lower price and the improved globe holder furnishes a quicker means of attaching and removing the globe.

The Sollite Luminaire is available in ceiling and suspension types with globes from 8 to 20 inches in diameter for lamps of from 50 to 1000 watts capacity. Listed in the Westinghouse Commercial Lighting Catalog 288-B.

FOR LABORATORIES AND SHOPS

For laboratories and for any other installations, where there may be corrosive fumes, the Chromilux Luminaire should be used. It is similar in construction to the semi-rigid Sollux Luminaire, with the exception that the hanger is chromium plated. Chromium plating takes a permanent bright finish and is not subject to corrosion. Listed in Commercial Lighting Catalog 288-B.

For foundry laboratories and similar installations in engineering schools, Westinghouse improved vapor-proof units are suitable. They consist of cast-iron hoods, housing front-connected sockets, vapor-proof glass globes and suitable reflectors. They are easy to install and assure an installation that is positively unaffected by vapor and corrosive fumes.

For general lighting in manual-training shops and similar installations, the Westinghouse line of Glassteel Diffusers and industrial reflectors assure a most satisfactory lighting installation. Listed in Industrial Lighting Catalog 288-A.

FOR OUTDOOR LIGHTING

Westinghouse Chromilite Floodlighting Equipment is most suitable for lighting large outdoor areas and for the floodlighting of buildings and monuments. These Westinghouse Projectors are of cast aluminum, equipped with a Chromium-plated reflector. Chromium makes a most satisfactory reflecting surface on account of the high polish it takes and because it retains this polish permanently, and is easily cleaned. The different type designations are: CA-10, CA-14, and CA-16 which will take care of 150 to 200; 300 to 500; and 750 to 1000-watt lamps respectively. Listed in Floodlighting Catalog 288-C.

THE ILLUMINATING ENGINEERING BUREAU

Westinghouse maintains this Bureau to give advice and help in planning correct lighting, yours for the asking. Requests can be made at any Westinghouse Agent-Jobber or District Office.

See pages 342 and 460 for other products.

WRIGHT RUBBER PRODUCTS CO.

P. O. Box 696, RACINE, WISCONSIN

Manufacturers of

WRIGHT RUBBER TILE

Rubber Only Material That Withstands Tire Road Wear

FOR

Floor Tile, Wainscoting, Stair Treads, Industrial Floor Blocks, Bridge Sidewalks and Bridge Paving Blocks

LIBRARY, WASHINGTON PARK HIGH SCHOOL, RACINE, WIS.
Croft & Boerner, Architects, Minneapolis, Minn.

WRIGHT Rubber Tile is the ideal floor for Assembly Rooms, Corridors, Libraries, Class Rooms, Offices and Stairways.

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WRIGHT Rubber Tile used for Cafeteria Table and Counter Tops or for Chemical Laboratory Table Tops combines beauty with service.

Complete data in Sweet's Architectural Catalog or the same information will be mailed in pamphlet form.

Section III

MODERNIZATION, MAINTENANCE AND INSURANCE

Modernization of Old School Buildings

BY GEORGE F. WOMRATH

ASSISTANT SUPERINTENDENT OF SCHOOLS, IN CHARGE OF BUSINESS AFFAIRS, MINNEAPOLIS, MINN.

AMERICANS are notoriously profligate. Conservation of property, private or public, has not been written into the national code. Throughout the length and breadth of the nation denuded forest land presents bleak evidence of the spirit of waste. Abandoned sterile farms from coast to coast bear silent testimony as to the ignorance of farmers who squeezed the last ounce of life out of the soil. Automobile graveyards filled with thousands of little-used but much-abused cars attest an age of carelessness and indifference. Innumerable instances of the inordinate wastefulness of the citizens of the United States might be cited, but none so monumental as the decrepit and disintegrating schoolhouses standing in every city, village and hamlet as memorials of a spendthrift and negligent people who readily react negatively to the plaint, "Can the nation afford to educate its children?", but whose whole attitude towards life seems to be "Off with the old; on with the new."

The building industry is by far the greatest of the basic industries of the United States. The *Architectural Forum's* forecast for 1929 is that the investment in new structures and replacements will exceed ten billions of dollars. Of this sum, new public schools will absorb one-half billion. The report published in 1920 by the American City Bureau on behalf of the National Committee on Chamber of Commerce Cooperation with the Public Schools said: "The part of the total expenditure (on old school buildings) being spent for the alteration and equipment of old buildings is only 1.8 per cent. The smallness of this amount is of particular interest in connection with the findings of this Committee in its report on School Housing Conditions in American Cities. This report shows that a large per cent of the children in the public schools of American cities are continually menaced by the unsanitary conditions and fire hazards in many old school buildings now in use. How little is being done to remedy this condition is indicated by the findings of the present study. In the Eastern cities the condition is particularly bad. More is being done to remedy conditions of congestion than to make old buildings fit for use."

School buildings have not changed fundamentally in a hundred years. Their basic instructional classroom arrangement has remained constant. Many schoolhouses built early in the nineteenth century are still in use and functioning satisfactorily. By judicious remodeling from time to time, the space in many of these buildings has been arranged to accommodate the new activities of an ever expanding curriculum, conclusively demonstrating that old buildings can be rehabilitated and maintained in a state of satisfactory usefulness and appearance.

While the heart and soul of education is still centered in classroom instruction, many new types of rooms have been added in recent years, such as departmental rooms, auditoriums, gymnasiums, chorus rooms and study rooms, all of which have resulted in much larger buildings than were formerly needed. The most conspicuous material changes that have taken place have been concerned with structural and mechanical features. Improvements in artistry of design, in safety construction, in durability of materials used, in the use of economic and automatic heating and ventilating equipment, and in sanitary and hygienic appurtenances, have been the predominating outward betterments of modern school buildings. To remodel many old schoolhouses to conform to these modern requirements is both possible and practicable. Many communities have already done so, thereby transforming their old structures into schoolhouses useful for many decades to come and comparable in all utilitarian respects with modern buildings. When we shall have become true conservators of old school property, we shall enjoy one of the immediate corollaries of conservation; namely, a reduction in the high cost of education.

In the early history of schools scarcely any thought was given to the maintenance of property in first-class condition. As a result, many of the older buildings have fallen into an almost unrestorable state of disrepair and the communities confronted with this unfortunate situation now have to provide not only for current rehabilitation but also for the accumulated undone repair and alteration work of the years that have passed.

Determining Whether a Building Should Be Abandoned

In order to proceed wisely, it is absolutely necessary that some idea be obtained about the general condition of an old school building before entering upon a program of modernization. To do this, a comprehensive survey of the building should be made. Such a survey should furnish a guide to determine the wisdom of attempting to rehabilitate it. To illustrate: A schoolhouse may be of such ancient construction and poor design, the condition of the roof, walls and floors so deplorably out of repair, and the impracticability of installing modern heating, ventilating, lighting and sanitary facilities so obvious, that any expenditure of money in an attempt to modernize the building would be a flagrant waste of public funds and totally unwarranted, as even after the alterations and improvements were made the size of the classrooms would be too small, the non-fire-resistive type of construction would violate all safety codes, the mechanical equipment would be ineffective and inefficient, and in many other respects the building would be unsatisfactory and unacceptable as a modern schoolhouse. Under no circumstances should a school building that is unsafe from both a structural and a sanitary standpoint be utilized just because the shell of a building is available and money for a new building difficult to get. Invariably, the safety of the child should be given first consideration.

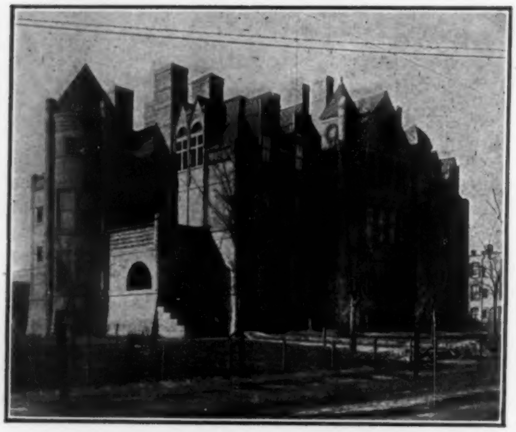

PLATE 1. TYPICAL OLD THREE-STORY SCHOOL BUILDING OF NON-FIRE-RESISTIVE CONSTRUCTION

PLATE 2. THE BUILDING SHOWN IN PLATE 1 REMODELED INTO A FLAT-ROOFED TWO-STORY BUILDING

The following principles have been laid down by John C. Almack, Ph.D., with reference to the abandonment of old school buildings:

1. A building should be abandoned at once when it is unsafe, or when the health and morals of the children are seriously threatened by its continued operation.
2. It should be abandoned when the maintenace and added cost of operation are sufficient to offset maintenance and interest charges on a new building of equal capacity and utility.
3. It should be abandoned when it is inconvenient from the point of view of accessibility, as when the residence section has moved away.
4. It should be abandoned when manifestly unsuited to modern school needs and too far depreciated physically to warrant alterations and additions.

When the survey of a school building reveals that no reason for abandonment prevails, modernization may proceed along the following lines:

Three-Story Buildings

If the building is a three-story building of non-fire-resistive construction, the third story should be removed. (See Plates 1 and 2.) It is extra-hazardous to house children in such buildings. Fire-escapes will not eliminate the hazard and danger to life imminent in all such structures.

A two-story schoolhouse is not dependent wholly upon Class A fire-resistive construction. The danger from fire will be minimized if attention is given to the proper arrangement for, and provision of, a sufficient number of exits and fire-stairs; the avoidance of all pockets in corridors and at exits; the removal of open stair wells of wood construction, and their replacement with stairways of moderately fire-resistive construction protected underfoot and overhead with automatic sprinklers; the provision of handily placed fire-extinguishers and fire-fighting equipment; and the systematic training of pupils in fire-drills.

Roofs

Hipped and peaked roofs with gables and dormers are highly undesirable and, in general, should be removed and replaced with flat roofs. Architectural design may in some special instances govern this procedure. A high, peaked roof generally covers an attic which is a veritable forest of exceedingly dry and highly inflammable timbers. (See Plate 3). These attics are often used as storerooms for all kinds of objectionable rubbish of an extra-hazardous fire-engendering nature.

Peaked roofs are expensive to maintain and a constant source of menace in winter on account of sliding snow and ice. A slate or tile roof intro-

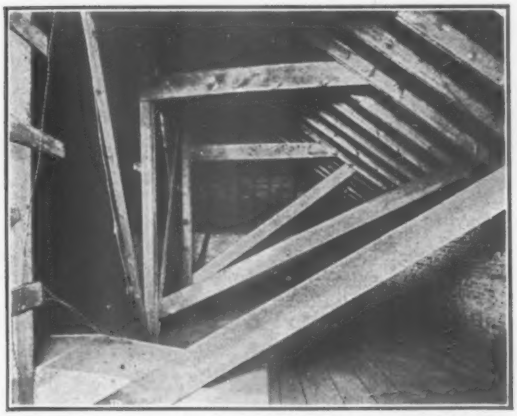

PLATE 3. A TYPICAL ATTIC UNDER A PEAKED ROOF

duces the additional danger from pieces of slate or tile becoming detached and falling upon people below.

Roof parapets* simple in design and sturdy in construction should be provided for all flat roofs. Avoid ornamentation that will disintegrate under the action of time or the elements; and exposed joints into which water may penetrate and become the source of leakage into the building. A poorly built parapet is subjected to great strains in winter by reason of alternate freezing and thawing of water and ice; and in summer by reason of abnormal contraction due to intense heat, resulting in both instances in constant need for repairs.

* The recent (December, 1928) study of parapets by I. F. Stern, consulting engineer, Chicago, Ill., is of noteworthy value.

PLATE 4. WINDOW-GUARDS, HINGED AND OPENED FROM INSIDE ONLY

Windows

Wrongly located windows and the lack of glass area are among the main defects in old buildings. The universal practice in modern schoolhouse construction is to provide every classroom with windows having a glass area equal to at least 20 per cent of the floor area and every room lighted from one side only. The rooms in many old buildings are lighted from two and in some cases three sides, the combined glass area often being less than 10 per cent of the floor area. Here is one of the principal features for attention in modernizing an old school building. Large windows with the requisite amount of glass area should be installed on only one side of each classroom, and all other windows blocked out. This sometimes requires considerable ingenuity and maneuvering to accomplish, but generally can be done. The glass used in the window-sash should be small panes, to offset the high cost of original investment and subsequent replacement. The window frames should be calked and the window-sash weather-stripped.

Window-guards (Plate 4) should be attached to all ground-floor windows adjacent to playgrounds. A very large proportion of schoolhouse glass breakage is purely accidental and due to unavoidable causes during baseball and other outdoor games.

Plastered Walls

Wherever the plaster on the walls and ceilings of old schoolhouses has lost its vitality or has been badly damaged by water, or for any other cause is in danger of falling, it should be removed and the walls resurfaced. This is one of the most expensive items for correction and one of the dirtiest jobs attached to the modernization of old buildings. To take old plaster off the walls and remove it from the building is also one of the meanest jobs connected with rehabilitation work, the dust and fine particles of plaster working into every nook and crevice and being especially difficult to remove.

A highly satisfactory procedure is not to remove the old plaster at all but to cover it with a high-grade insulation material such as Celotex, Insulite, Nu-Wood, or a similar product. This material is put on the wall right over the old plaster without attempting to clean it or make repairs of any kind, as the insulation material hides the old plaster and strengthens and holds it in place. The joints are then covered with battens and painted. This treatment is comparatively inexpensive and produces a very attractive finish. (Plate 5.)

Stairs

Old wood stairways should be replaced with concrete or iron stairways, preferably inclosed within fire-walls. Open stair wells should be avoided as extremely dangerous. All spaces under stairs, especially at exits, should be fireproofed. (Plate 6.) One of the most frequent causes of schoolhouse fires has been materials stored in

PLATE 5. PLASTERED WALLS RESURFACED WITH INSULATION BOARDS

these places. If under an exit, the fire at once is communicated to the stairs if these are built of wood and means of egress from the building proportionately blocked.

Flooring

If the floors in an old building are of wood, they should be repaired or replaced with new wood flooring. It is important that classroom flooring should be of a material that will permit desks and furniture to be removed and reset frequently without damaging the floor. Except in special rooms, such as toilet-rooms, wood substitutes such as cement, tile, asphalt, rubber, stone, linoleum, mastic, terrazzo, cork and other materials are not advised, as it cannot be claimed that these substitutes have proved to be panaceas for all floor troubles, nor such pronounced improvement over wood as to make their use unquestioned. The hard reflecting surface of many of these materials is accountable for much of the increase in noise, echo and reverberation so plainly noticeable in many new buildings. For all-around satisfaction and service, wood flooring for ordinary rooms has been seldom equaled and never surpassed.

The flooring which is to be used having been selected, care should be taken to see that it is properly laid. The number of schoolhouse floors in good condition throughout the United States is so surprisingly small, because improperly laid, that it is quite worth while to give the situation special attention. With wood floors, the nailing strips should be fastened down securely and the floor nails closely spaced or the finished floor will be squeaky and noisy. If floors of other materials are laid so that the bond between them and the sub-floor is not complete, they become loose and quickly disintegrate. Means should be provided for expansion and contraction or these floors will crack badly.

Wall Painting

Schoolhouse walls should be painted with a gloss paint of such quality that it can be washed frequently without losing its luster. The characteristics of the paint should include durability and freedom from crazing, cracking, peeling, fading, air checking, lime burns and flatting. Paint entirely free from lead pigment may be applied while the school is in session without any harmful results to the occupants of the building. This is often of great convenience and avoids the necessity of concentrating all painting work within the period of the summer vacation.

Care should be taken in the preparation of the walls and woodwork before they are painted. A little extra precaution and the spending of a little more money at this stage of the work avoids large subsequent expenditures. All calsomine and cold-water paints should be completely removed from the walls, and all walls painted with oil paint should be thoroughly washed, before any repainting work is done. Oil stains and alkali burns should be specially treated with acid and aluminum. If these precautions are taken and a good paint used, a three-coat job, with an occasional washing, should give from twelve to eighteen years' service.

Blackboards

Natural slate blackboards should be installed, if not already in the building. Plaster that has been painted black, and soft composition boards, are not satisfactory. If the building is equipped with natural slate blackboards that are rough and

PLATE 6. STORAGE SPACE UNDER STAIRS SHOULD BE FIREPROOFED

PLATE 7. DISPLAY WIRES

gray, they can be readily and very inexpensively renewed by rubbing the surface with an ordinary rough brick, using plenty of water, until the rough and gray surface has been removed. Then finish the surface by repeating the process with another brick of a finer texture. Pumice stone will produce better results than bricks. This treatment will restore the surface of the slate at a cost of from 2 to 5 cents a square foot.

Over a period of years it has happened not infrequently that the grades of the pupils occupying the classrooms are quite different from the grades for which the rooms were originally designed and equipped. It is important, therefore, either to rearrange the classification of the rooms by changing the pupils or to rehang the blackboards at suitable heights to meet the reaching ability of the pupils occupying each room. This is as important in the modernization of old schoolhouses as are seat posture and size of seats.

Bulletin Boards and Display Wires

Modern classroom practice involves a considerable display of the work of the children. The absence of any provision for properly displaying this work is evidenced by the badly marred and disfigured walls and woodwork in both old and new buildings as a result of hanging display work with pins, thumb tacks, stickers and nails. To avoid this, every room should be provided with a bulletin board and with two or three tightly stretched wires above the blackboard molding, and a single wire stretched just below the chalk-rail, so that the display work which the teachers want to exhibit may either be fastened on the bulletin board or stood up behind the wires above the blackboard (Plate 7) or hung on the wire under the chalk-rail by means of small clips.

Entrance Doors

Heavy, solid entrance doors (Plate 8) should be replaced with light-weight, glazed doors (Plate 9) equipped with safety latches so they may be easily opened by the smallest child. The glazing allows light to penetrate into the vestibule and affords sanitation and safety. Good practice is to provide two single, light-weight doors for every opening, with a rubber-faced tee iron on the meeting edges of the doors. This construction reduces weight, minimizes shrinkage and swelling, simplifies the application of panic bolts, and excludes drafts, snow and rain.

Door-Sills

Particular attention should be given to worn door-sills at entrances. Door-sills that become hollowed should be replaced with granite sills. A hollow sill presents a very grave cause for children to trip and fall. Worn sills also allow large quantities of cold winter air to blow into the building under the doors, chilling the corridors and increasing the coal bill.

Wardrobes

Wet, smelly clothing when hung on hooks and exposed in classrooms is highly objectionable and

PLATE 8. TYPICAL HEAVY, SOLID ENTRANCE DOORS

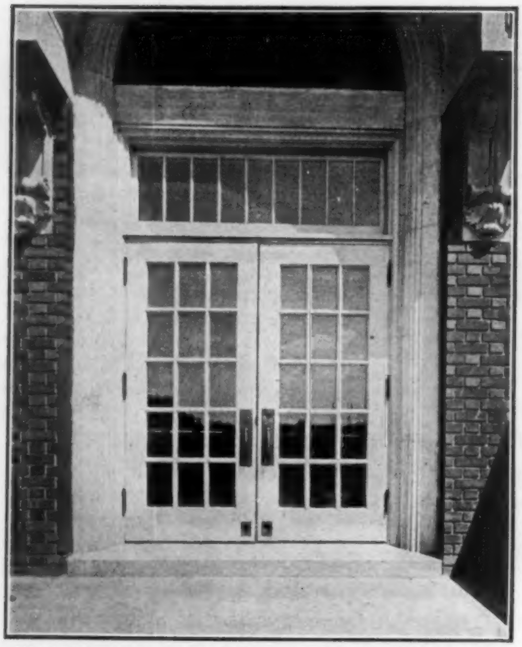

PLATE 9. TYPICAL LIGHT-WEIGHT GLAZED DOORS

exceedingly insanitary. There are many different types of built-in wardrobes and lockers to provide storage space for the wraps and personal belongings of pupils. Adjustable sectional wardrobe poles (Plate 10) are a boon for old school buildings with cloakrooms and for schoolhouses in states where separate cloakrooms are still compulsory under their building codes.

Kick-Plates

All outside doors, toilet-room doors, and doors that must be used frequently should be provided with kick-plates. The plate should extend the entire width of the door and be about 8 inches high and of a rust-proof material. The lower edge of the plate when fastened to the door should not be more than ¼-inch from the bottom edge of the door. These kick-plates protect the wood and paint from the damaging kicks of agile boot-toes of children in a hurry.

Picture Molding

Picture molding should be provided in all rooms and corridors, and strict rules enforced prohibiting the hanging of pictures except from the molding. The hanging of pictures by means of nails and hooks driven into the walls and woodwork should not be allowed. Large, heavy pictures should be hung by means of expansion bolts inserted in wood plugs and securely fastened into the wall.

General Building Construction Refinements

When scoring an old school building for modernization, many general building construction refinements suggest themselves. Door-checks prevent doors from slamming and distracting the attention of pupils and teachers. Glazed classroom doors allow easy inspection of rooms from the corridor and help in the lighting of the corridor. A very generous amount of shelving, cupboard and closet space should be provided for storing the large amount of materials and supplies needed in modern instructional work. To reveal the orderliness of their contents, all cupboards and closets should have glass doors. Card plates on all classroom doors prevent marring the woodwork with pinned-up notices and add to the neatness of the building. Double-hung window shades are exceptionally beneficial and a vast improvement over the old style single-hung shades.

Heating Plant

High-pressure heating plants should be converted into or replaced with low-pressure heating systems operated at 5 pounds pressure *or less*.

In a high-pressure plant carrying from 50 to 150 pounds pressure, the high tension on every part of the equipment introduces factors which invite breakdowns, and duplicate equipment is essential to avoid shutting down the plant in case any one unit fails to function. These conditions are not present when operating under low pressure.

High-pressure boilers require an expert, high licensed engineer to be always present while the boilers are in operation. Low-pressure boilers can be left without an attendant for long periods of time and the engineers released to do janitorial work about the buildings. This means fewer men on the payroll. Even if the fires go out, no harm results. With high-pressure boilers, if the pressure goes down, the steam-driven pumps, engines and other machinery come to a standstill, the ventilation system stops, no water is pumped into the boilers, and the whole system is put out of commission and left in a dangerous condition.

When low fires are needed on account of warm outdoor temperature, it is very difficult to handle a high-pressure plant economically. With low

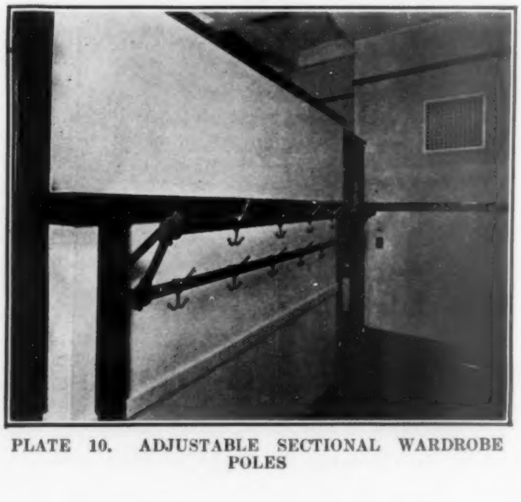

PLATE 10. ADJUSTABLE SECTIONAL WARDROBE POLES

fires, the high-pressure steam-driven auxiliary apparatus cannot be operated. With a low-pressure plant, the fires can be banked to give just enough heat to take the chill off the building, and the motor-driven auxiliary apparatus can be operated independently of the boiler.

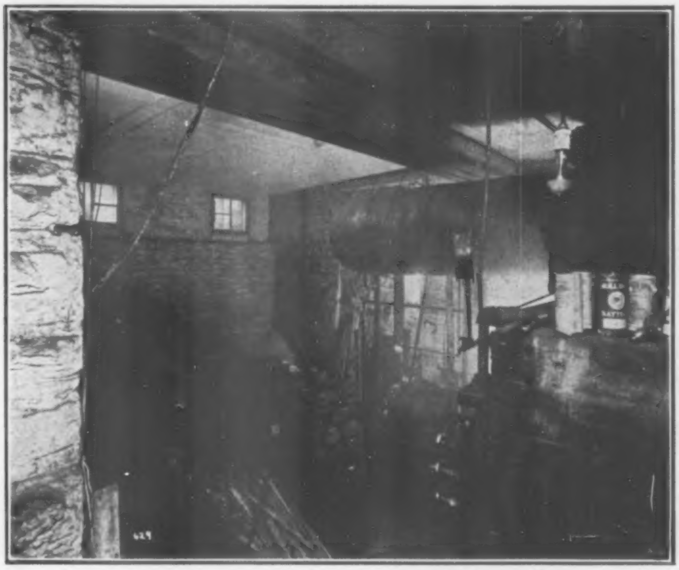

PLATE 11. TYPICAL ANCIENT BOILER ROOM

The boiler settings and all boiler parts of a high-pressure plant are operated under exceedingly high temperatures throughout the day, and allowed to cool off at night. This constant heating and cooling causes rapid and extreme expansion and contraction, which is highly injurious to the entire equipment. These damaging variations in temperature do not take place in a low-pressure system.

Schoolhouse boiler fires are banked every night and over Sundays and holidays. Engineers coming to work late on school-day mornings rush the fires in order to get up steam quickly. Intense heat is thereby suddenly thrown on comparatively cold brickwork and other parts of the plant, with disruptive and damaging results. Low-pressure boilers, especially those of the fire-box type with no brick setting, are much less subject to damage from this procedure than are high-pressure boilers.

Boiler, Ash and Fuel Rooms

Boiler, ash and fuel rooms should be completely separated by fireproof walls for cleanliness and safety. (Plates 11 and 12.) Every boiler room should have an outside exit. Ceilings under classrooms should be fireproofed. Wooden doors, steps, ladders and platforms should be removed and replaced with brick and iron construction. Iron ladders and platforms should be provided for safe and easy access to all overhead valves, pipe lines and fittings.

Boilers

Antique boilers equipped with inefficient and smoke-producing furnaces, especially those of the Burke and Dutch oven type, should be replaced with modern boilers with smoke-consuming furnaces. Badly laid-out and poorly constructed settings, furnaces, combustion chambers and ash-pits, and all undersized fittings, piping, connections and secondary equipment, should be corrected while modernizing the primary equipment of the boiler plant.

Chimneys

Architects no longer look upon schoolhouse chimneys as disfigurements to the buildings. The simple expedient of building up all low, highly inefficient chimneys to a height which will produce sufficient draft for the boilers, results in an increase in boiler-plant efficiency and less smoke, and not infrequently has increased the capacity of existing boilers to such an extent that large additions have been made to old buildings without requiring any change in the old boiler

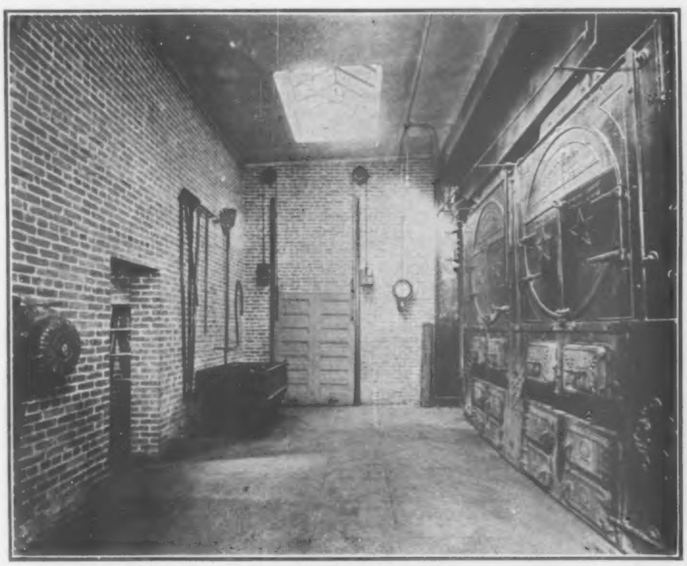

PLATE 12. TYPICAL MODERN BOILER ROOM

equipment. Undersized breechings should be enlarged, else neither the boilers nor the chimneys can function properly.

Ventilation

Modern ventilation systems greatly simplify the problem of installing ventilating equipment in old school buildings. When the central fan system prevailed as the only proper system for the ventilation of schoolhouses, an insurmountable situation was often presented by the necessity of providing a large fan room in the basement of the building and extending large galvanized-iron air ducts from this room to all parts of the building, and foul-air ducts from all rooms to the attic or roof. No basement space could be found in many old buildings, and the walls and partitions were not constructed so that the ducts could be built into them, nor was there enough space on the outside of the walls and partitions to which the ducts could be attached. Very often there was not enough excess steam pressure to drive a fan engine.

With the advent of the electrically operated individual room ventilating unit, which can be installed in a small space on the floor of the classroom under a window or on the ceiling over the cloakroom, no difficulty whatsoever is encountered in modernizing the ventilating system in old buildings. The rapid strides being made in open window ventilation portend a still further simplification of ventilating equipment and its installation.

Foul-air ducts can be eliminated by placing a grille in the corridor wall of each classroom and discharging the air into the corridor, thence up the stairways into the attic or roof space through a grille in the top-story ceiling, and thence to the outdoor atmosphere by means of roof rotors or exhaust fans. The attic or roof space can be so constructed that the air will not discharge too quickly or produce a waste of heat at the air intake points in the classrooms.

Grilles Over Duct Openings

Grilles should be removed from the openings to all foul-air ducts. (Plates 13 and 14.) The space in the wall back of these grilles fills with dust, dirt and rubbish and becomes a very objectionable center of insanitation.

Radiators and Radiator Shields

If a building is equipped with steam coils running back and forth around the classrooms, they should be replaced with sectional radiation.

Radiators are usually set directly in front of the windows. A radiator shield in front of each radiator forms a chimney effect for the heat from the radiator and directs the hot air up along the window-glass surface, thereby giving better circulation and better distribution of the heat; avoids hot spots for children who sit next to the radiators; and prevents children from being burned through contact with hot radiators.

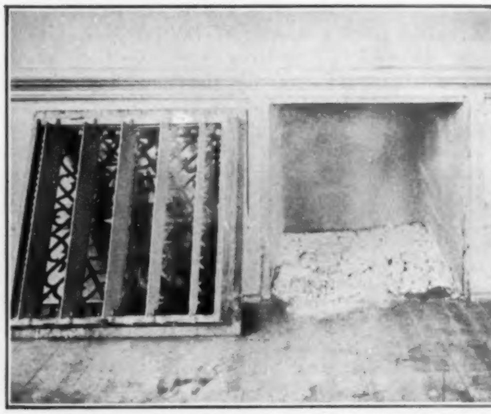

PLATE 13. GRILLE REMOVED FROM OLD FOUL-AIR DUCT

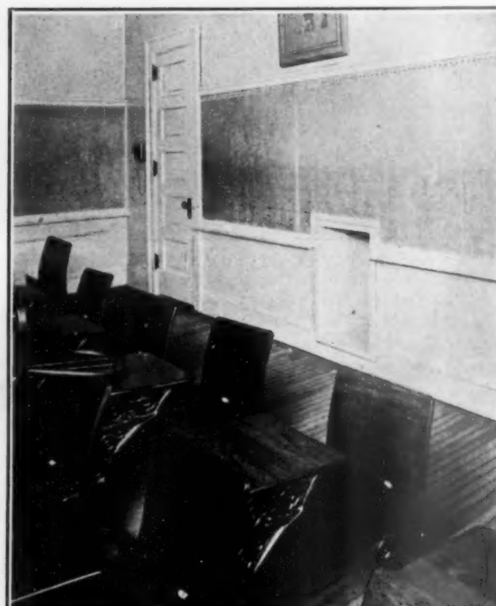

PLATE 14. MODERNIZED FOUL-AIR DUCT WITHOUT GRILLE

Temperature Control

It is difficult to be comfortable or to do good work in a room in which the temperature is alternately hot and cold. Hand-operated temperature control is laborious, unsatisfactory and wasteful of heat. Absorbed in their classroom work, teachers forget about the room temperature until it is so hot the radiator valves have to be completely shut off. Then the room temperature is again forgotten until the room becomes so cold the valves have to be completely opened. This procedure results in the room's being alternately hot and cold. Automatic control overcomes this situation and gives reasonably uniform room temperatures.

Separate Control

When remodeling old buildings, separate steam lines should be run with independent valve control so that certain rooms may be heated without heating all other parts of the building. Separate steam lines to the main office, library, conservatory and toilet-rooms provide for the heating of these rooms when the rest of the building is not in use.

Plumbing

There is no more important work in connection with the modernization of public school buildings, old and new, than that which has to do with their sanitary and hygienic conditions.

City schoolhouses should be connected with the city water-mains and sewers. Rural schoolhouses should be provided with artesian wells, automatic pumping-plants, and modern sanitary sewage-disposal systems. Cesspools and outdoor latrines should be unceremoniously eliminated. Plate 15 was made from a photograph taken in 1928 in a schoolhouse in a city of over 350,000 population and shows a condition which is not so exceptional as is generally believed. A condition of this sort cannot be too severely condemned. In too many instances, reprehensible conditions which formerly attached to outdoor latrines simply have been transferred to indoor toilet-rooms and should not be tolerated.

Toilet- and Shower-Rooms

Plate 16 shows one of many obsolete toilet-rooms still to be found in many old schoolhouses throughout the United States. Old-style toilet fixtures, wood partitions, whitewashed walls, no natural lighting, no ventilation, and no lavatories, make these old, dark vaults highly objectionable. They should be replaced with modern, clean, light, sanitary, well-ventilated toilet-rooms with enameled walls, concrete partitions, modern toilet and urinal fixtures, and lavatories with hot and cold water.

Toilet fixtures should be sanitary and preferably of the extended lip type, with extended lip, open front seats. Automatic flush valves (Plates 17 and 18) are coming into favor, but there is nothing objectionable to flush boxes (Plate 19) if properly made with non-corrosive, jointless metal lining and parts, including metal gaskets.

Urinal fixtures should be of heavy vitreous nonabsorbent china or heavily enameled iron. Porcelain fixtures are to be condemned, as the material is very porous and becomes foul when the outside glaze is cracked or chipped. While slate is not in itself insanitary, it should be avoided because of its black and unsightly appearance.

All wood should be removed from toilet- and shower-rooms, as it quickly deteriorates in the presence of moisture, warps out of shape, and becomes insanitary. All trim and fixtures should be cement, metal or other durable, impervious, sanitary material. Toilet-stall partitions when made

PLATE 15. AN ANCIENT RELIC

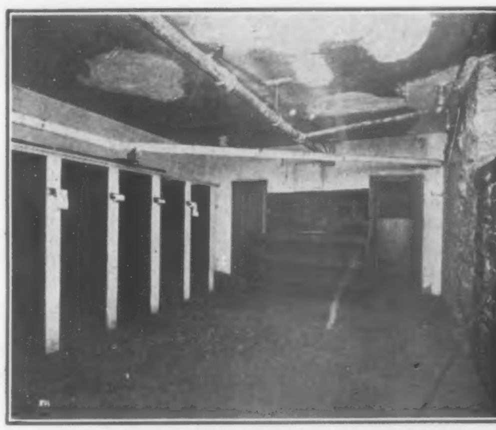

PLATE 16. TYPICAL OLD TOILET-ROOM

PLATE 17. MODERN TOILET-STALL AND FIXTURES WITH AUTOMATIC FLUSH VALVE

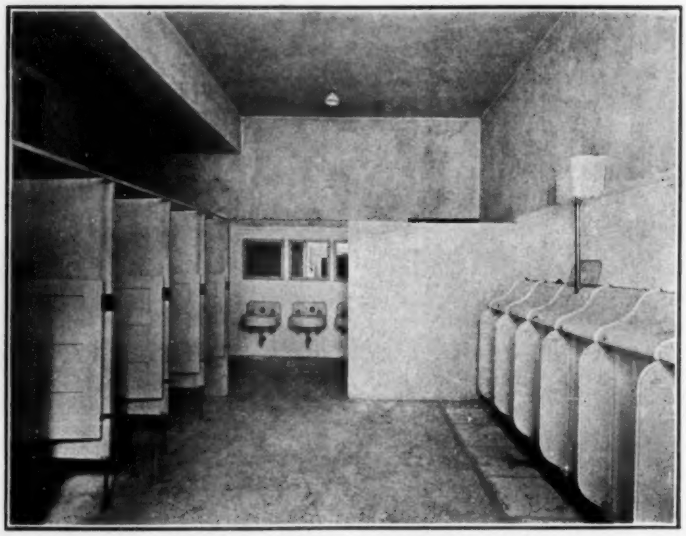

PLATE 18. MODERNIZED TOILET-ROOM

of cement or metal also withstand the onslaught of the pencils and jackknives of youthful embryo artists and poets. All fixtures should be avoided that involve many joints which may become loose and filled with filth or which, by reason of their color, cannot easily be observed for lack of cleanliness.

The walls of toilet- and shower-rooms should be plastered with cement plaster and painted with heavy, waterproof white enamel paint. Care should be exercised in laying the floor to avoid low spots which may fill with standing, dirty water. Shower-stall curtains should be of heavy, washable, waterproof canvas. (Plates 20 and 21.)

Hot-Air Hand-Drying Machines

The use of electric air drying machines versus linen or paper towels may be included under modernization procedures.

The time required per wipe is approximately 35 seconds with either linen towels or hot air. If towels are conveniently available, 65 per cent of the students in a schoolhouse will use them. On the basis of 100 per cent service, which means the supplying of enough towels to allow every student and teacher the use of a clean towel as often as needed, experiments have yielded data which indicate that the use of electric air drying machines will net a saving of 63 per cent of the cost of linen towels in a school building housing 1,077 pupils.

Cost of linen towel service on 100 per cent basis: 700 towels per day (65 per cent of 1,077) or 3,500 towels per week, at 40¢ per 100 for 38 weeks....		$532.00
Cost of electric air drying: 10 machines at $110, and depreciated 10 per cent per year	$110.00	
Current per wipe $.00042, and 3,500 wipes per week for 38 weeks	55.86	165.86
Saving per year		$366.14

PLATE 19. MODERN TOILET-STALL AND INSTALLATION OF FIXTURES WITH APPROVED FLUSH-BOX

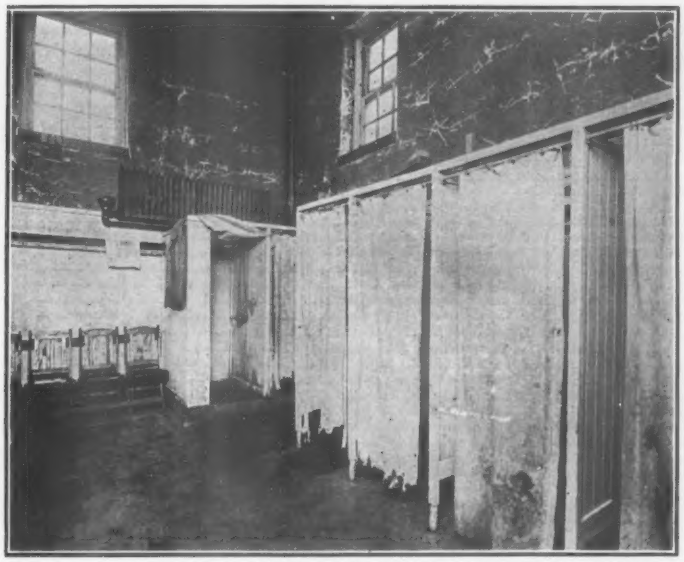

PLATE 20. TYPICAL SHOWER-ROOM WITH WOOD STALLS, RUBBER CURTAINS, AND WALLS PAINTED WITH ORDINARY PAINT

With air drying service all the inconveniences of linen towel and paper towel service are eliminated, such as handling soiled linen, keeping racks filled, sorting and counting, loss and abuse of towels.

Electrical Equipment

The modernization of old school buildings includes their complete electrification. This can be easily done, as modern electrical work can be installed without disturbing the walls and partitions of the buildings to any great extent.

All steam-driven engines and pumps should be replaced with motor-driven equipment. Rural schools can be inexpensively electrified by the installation of a farm lighting and power system. Electric clock systems should replace hand-wound clocks. Electrically operated fire-alarm systems of the electric siren and break-glass station type should be among the first improvements to be made. A house telephone system increases the administrative efficiency of the principal and, when installed with radio and amplifying connections, converts every classroom into an auditorium. Electric plug-in receptacles should be provided rather generously, in order to make it convenient to connect moving-picture machines, stereopticons, radio outfits, glue heaters, electric plates, eye-testing brackets, and other instructional and modern schoolhouse conveniences.

In Conclusion

This article has been prepared primarily to call attention to the need for conservation of old school buildings and the major items involved with their modernization. There are numerous minor items which should be given attention whenever an old building is remodeled or rehabilitated. As with nearly every branch of school administrative work, use should be made of a score card (pages 142 to 145) as a mental tickler when surveying a building to ascertain its physical condition. The chronological order in which remodeling work should be done when modernizing an old building is of considerable importance. Roofs should be given first attention, as a leaky roof may ruin interior work on which large sums of money have been expended. All work that necessitates cutting of walls and floors should be done before reflooring and replastering. Painting should be done only after all other work has been performed.

PLATE 21. MODERN SHOWER ROOM, WITH CEMENT STALLS, CANVAS CURTAINS, AND ENAMELED WATERPROOF WALLS

Date of Survey________________

By________________

SCHOOL________________

SCORE CARD

REPAIRS AND IMPROVEMENTS (REHABILITATION)

MINNEAPOLIS PUBLIC SCHOOLS
OFFICE OF THE
BUSINESS SUPERINTENDENT

I. GROUNDS

	Ultimate Requirements	R = R&I B = Bonds Request for Year 19	19
1. CURB:			
(a) New			
(b) Repair			
2. GUTTERS:			
(a) New			
(b) Repairs			
3. SIDEWALKS:			
(a) New			
(b) Repairs			
(c) Intersections			
4. YARDWALKS:			
(a) New			
(b) Repairs			
5. DRIVEWAYS:			
(a) New			
(b) Repairs			
(c) Over sidewalks			
(d) Old driveways out			
6. STEPS:			
(a) New			
(b) Repairs			
7. RETAINING WALLS:			
(a) New			
(b) Repairs			
8. TREES:			
(a) On outside boulevards			
(b) On inside boulevards			
(c) On school grounds			
9. BOULEVARDS:			
(a) Sodded			
(b) Cut down			
(c) Gravelled			
10. PLAYGROUNDS:			
(a) Filling			
(b) Grading			
(c) Surfacing			
(d) Removing boulders			
SUB TOTAL			

	Ultimate Requirements	R = R&I B = Bonds Request for Year 19	19
AMOUNT FORWARD			
11. FENCES (new and repair):			
(a) Pipe around lawns			
(b) Standard 6′			
(c) Standard 12′			
(d) Wire ribbon			
(e) Corner protections			
12. ALLEY OUTLETS TO BE PROVIDED			
13. LANDSCAPING:			
(a) Lawns			
(b) Vines			
(c) Shrubs			
(d) Flower beds			
(e) Black dirt			
(f) Fertilizer			
(g) Sodding			
(h) Seeding			
14. LAWN WATERING SYSTEMS			
15. TOOLS AND EQUIPMENT:			
(a) Mowers			
(b) Sprinklers			
(c) Hose			
(d) Hose reels			
(e) Shovels			
(f) Rakes			
(g) Spades			
(h) Spading forks			
(i) Shears			
(j) Scythes			
(k) Sickles, etc.			
TOTAL			
% OVERHEAD			
GRAND TOTAL			

Date of Survey________________

By________________

SCHOOL________________

SCORE CARD

REPAIRS AND IMPROVEMENTS (REHABILITATION)

MINNEAPOLIS PUBLIC SCHOOLS
OFFICE OF THE
BUSINESS SUPERINTENDENT

II. BUILDING AND CARPENTRY

	Ultimate Requirements	R = R&I B = Bonds Request for Year 19	19
1. WINDOW & DOOR REPAIRS & CHANGES			
2. PLASTERING—WALLS AND CEILINGS			
3. INSULATION BOARD FOR CEILINGS			
4. STANDARDIZE BLACKBOARDS:			
(a) Lower height			
(b) Wider board for teacher			
5. BLACKBOARDS:			
(a) Polishing			
(b) Resurfacing			
(c) Renewing			
6. REMOVAL OF NON-FIREPROOF WOOD AND GLASS PARTITIONS			
7. REPAIR AND REPLACEMENT OF FLOORS			
8. REPAIR AND RENEW STAIR TREADS AND LANDINGS			
9. CORK AND BULLETIN BOARDS IN CLASS ROOMS AND HALLS			
10. STAIR RAILS AND BALUSTRADES			
11. INSTALLATION OF WINDOW GUARDS			
12. FIREPROOFING UNDER STAIRS			
13. IRON LADDER & PLATFORM TO BOILER VALVES			
14. IRON LADDERS TO ATTICS			
15. EXITS FROM BOILER ROOM (state requirements):			
(a) Steps or ladders			
(b) Platforms			
(c) Doors			
16. LOWERING OF THREE STORY BUILDINGS			
17. GLAZING:			
(a) Remove cracked glass and replace with new			
(b) Replace broken glass			
18. LOCKS, KEYS, AND DOOR CHECKS:			
(a) Repairs			
(b) Replace keys			
(s) Key cabinets			
SUB TOTAL			

	Ultimate Requirements	R = R&I B = Bonds Request for Year 19	19
AMOUNT FORWARD			
18. LOCKS, KEYS, AND DOOR CHECKS:			
(d) Master keying of locks			
(e) Install door bumpers			
(f) Install door holders & door checks			
19. PATCH PAINTING (spread over all repair items)			
20. BUILDING MÅSONRY			
(a) Concrete base and floors wherever needed			
(b) Renew stone door sills and steps			
(c) Parapet walls on main bldg. roofs			
(d) Parapet walls on boiler room roofs			
21. PRESERVING MAPLE FLOORS			
22. FILLING CEMENT FLOORS			
23. GENERAL:			
(a) Shelving in teachers' closets			
(b) Lower base shoe and install new plinth blocks			
(c) Standard room moulding			
(d) Card plates on doors			
(e) Standard cloak rm. poles & hooks			
(f) Sash pole sockets—lifts window pole hangers			
(g) Guards for clocks and electric lights in gymnasiums			
(h) Kick plates on doors:			
(1) Exterior doors			
(2) Toilet doors			
(3) Other doors			
(i) Window caulking			
(j) Weather strips			
(k) Painting up in general			
TOTAL			
% OVERHEAD			
GRAND TOTAL			

Date of Survey________________

By________________

SCHOOL________________

SCORE CARD

REPAIRS AND IMPROVEMENTS (REHABILITATION)

MINNEAPOLIS PUBLIC SCHOOLS
OFFICE OF THE
BUSINESS SUPERINTENDENT

III. HEATING

	Ultimate Requirements	R=R&I B=Bonds Request for Year 19	19
1. Changing Heating Plant from High to Low Pressure:			
(a) Boiler changes			
(b) New mains			
(c) Radiator traps			
(d) Replace steam pumps with electrically driven pumps			
(e) Air pumps			
(f) Boiler feed pumps			
(g) Vacuum pumps			
(h) Sumpf pumps			
(i) Replace steam driven fan with electrical drive			
2. Changes in Radiation to Meet Modern Standards			
3. Adding Radiation Where There is Shortage			
4. Changing Steam Headers			
5. Changing Steam Mains, Risers, Returns, Etc.			
6. Separate Steam Lines to:			
(a) Library			
(b) Office			
(c) Auditorium			
(d) Gymnasium			
(e) Toilet rooms			
(f) Community room			
7. Repairs and Replacements re. Old Boilers			
8. Repairs and Replacements re. Boiler Settings			
9. Repairs and Replacements re. Blow Off Tanks, Hot Water Tanks, Valves, Piping, Etc.			
10. Repairs and Replacements re. Steam Gauges, Water Columns, Pop Valves, Safety Valves, Etc.			
Sub Total			

	Ultimate Requirements	R=R&I B=Bonds Request for Year 19	19
Amount Forward			
11. Radiator Shields			
12. Platform Coal Scales			
13. Boiler Metal Treatment			
14. Boiler Room Remodeling			
15. Coal Room Remodeling			
16. Ash Room Remodeling			
17. Boiler Breeching and Dampers			
18. Condensation Meters			
19. Draft Gauges			
20. Coal Trucks			
21. Ash Hoists			
22. Reheating Coils for Steam Lines to Shower Baths & Swimming Pools			
23. Smoke Stack Extensions			
Total			
% Overhead			
Grand Total			

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SCHOOL________________

SCORE CARD

REPAIRS AND IMPROVEMENTS (REHABILITATION)

MINNEAPOLIS PUBLIC SCHOOLS
OFFICE OF THE
BUSINESS SUPERINTENDENT

IV. TEMPERATURE CONTROL

	Ultimate Requirements	R=R&I B=Bonds Request for Year 19	19
1. Air Pumps			
2. Vacuum Pumps			
3. Piping			
4. Control Valves on Radiators			
5. Fresh and Foul Air Dampers			
6. Thermostats			
% Overhead			
Total			

Date of Survey__________

By__________

SCHOOL__________

SCORE CARD

REPAIRS AND IMPROVEMENTS (REHABILITATION)

MINNEAPOLIS PUBLIC SCHOOLS
OFFICE OF THE
BUSINESS SUPERINTENDENT

V. PLUMBING

	Ultimate Requirements	R=R&I B=Bonds Request for Year 19	19
1. GENERAL INTERIOR PLUMBING:			
(a) Install lavatories where needed			
(b) Mirrors over lavatories			
(c) Install drinking fountains where needed			
(d) Lowering of drinking fountains and lavatories			
(e) Install slop sink			
(f) Install drains for ice boxes			
(g) Additional sill cocks			
(h) Installation of shower room equipment			
(i) Changing plumbing to conform with City Ordinance			
(j) Replacing wooden partitions with cement to meet ordinance.			
(k) Installing toilets in:			
(1) Principal's office			
(2) Teachers' rest room			
(3) Kindergarten			
(4) Nurses' rooms, etc.			
(l) Install larger water mains			
(m) Replacing slate urinals with white enamel fixtures			
(n) Install complete hot water system to include:			
(1) Hot water storage tank			
(2) Hot water heater			
(3) Piping to all lavatories			
(o) Plumbing in connection with downspouts			
(p) Installation of shower room equipment			
(q) Standardization of nurses' room equipment			
(r) Removing old gas piping			
(s) Removal of water meters			
SUB TOTAL			

	Ultimate Requirements	R=R&I B=Bonds Request for Year 19	19
AMOUNT FORWARD			
1. GENERAL INTERIOR PLUMBING:			
(t) Replacing toilet seats			
(u) Replacement of toilet bowls			
(v) Replacement of toilet tanks			
(w) Installation of standard tank pulls			
(x) Installation of storm and back water valves.			
(y) Installation of iron covers on sewer cleanouts			
(z) Installation of standard pipe hangers			
2. OUTSIDE PLUMBING:			
(a) New and the replacement of old sewers			
(b) Building sewer manholes on school grounds			
(c) Lawn sprinkling systems			
(d) Increasing size of water service from street main to buildings			
(e) Cutting unused water taps			
TOTAL			
% OVERHEAD			
GRAND TOTAL			

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SCORE CARD

REPAIRS AND IMPROVEMENTS (REHABILITATION)

MINNEAPOLIS PUBLIC SCHOOLS
OFFICE OF THE
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VI. ELECTRICAL

	Ultimate Requirements	R=R&I B=Bonds Request for Year 19	19
1. SIGNAL SYSTEM:			
(a) Program bells—inside			
(b) Program bells—outside			
(c) Automatic door switch			
(d) Conduit work			
(e) Wiring			
(f) Outside bell guards			
(g) Combination clock and bell guard—gymnasium			
2. MASTER CLOCK:			
(a) Secondary clocks in all class rooms			
(b) Program to automatically operate the bells			
(c) Rectifier			
(d) Storage batteries			
(e) Storage batteries cabinet			
(f) Conduit work			
(g) Wiring			
3. TELEPHONE SYSTEM:			
(a) Conduit work			
(b) Wiring			
(c) Telephone switch board			
(d) Telephone instruments in each class room			
(e) Overhaul telephone system			
4. FIRE ALARM SYSTEM:			
(a) Conduit work			
(b) Wiring			
(c) Fire horns			
(d) Break glass fire stations			
(e) Trial switch			
5. POWER IN CONNECTION WITH LOW PRESSURE:			
(a) Install new power service			
(b) Conduit work			
(c) Wiring			
(d) Meters			
SUB TOTAL			

	Ultimate Requirements	R=R&I B=Bonds Request for Year 19	19
AMOUNT FORWARD			
(e) Starters			
(f) Compensators			
(g) Cabinets and panels			
(h) Motors to operate fan			
(i) Motors to operate air compres.			
(j) Motors to operate boiler feed vacuum pump			
(k) Motors to operate recirculating pump			
6. ELECTRIC LIGHTING, GENERAL:			
(a) New entrance service			
(b) Conduit work			
(c) Wiring			
(d) Glue Heaters, electric			
(e) Stereopticon plugs			
(f) Electric plates			
(g) Cabinets and panels			
(h) Class room lighting			
(i) Corridor lighting			
(j) Gymnasium lighting			
(k) Auditorium lighting			
(l) Removing and replacing conduits so the Celotex can be inst.			
(m) Cord adjusters			
(n) Pilot light outlets for flat irons			
(o) Foot lights			
(p) Stage floor outlets			
(q) Rearrange the lights in boiler rm.			
(r) Water column lights			
(s) Gauge steam lights			
(t) Receptacles in front and rear of boiler for extension			
(u) Portable electric lighting			
(v) Gymnasium light guards			
(w) Eye test bracket, hygiene room			
TOTAL			
% OVERHEAD			
GRAND TOTAL			

Date of Survey__________

By__________

SCHOOL__________

SCORE CARD

REPAIRS AND IMPROVEMENTS (REHABILITATION)

MINNEAPOLIS PUBLIC SCHOOLS. OFFICE OF THE BUSINESS SUPERINTENDENT

VII. PAINTING

	Ultimate Require-ments	R = R&I B = Bonds Request for Year 19	19		Ultimate Require-ments	R = R&I B = Bonds Request for Year 19	19
1. Office Suite				Amount Forward			
2. Hygiene Suite				16. Boiler Rooms:			
3. Book Room				(a) Boiler room			
4. Class Rooms:				(b) Engine room			
(a) Class rooms				(c) Fan room			
(b) Wardrobes				(d) Other rooms			
(c) Teachers' closets							
(d) Storage closets							
(e) Individual toilets							
5. Kindergarten and Work Room							
6. Primary Room and Work Room							
7. Unassigned Rooms							
8. Boys' Toilets							
9. Girls' Toilets							
10. Auditorium:							
(a) Main auditorium							
(b) Stage							
(c) Dressing rooms							
11. Gymnasium:							
(a) Gymnasium							
(b) Shower rooms							
(c) Locker rooms							
(d) Locker basket rooms							
(e) Instructors' rooms							
(f) Other rooms							
12. Pupils' Lunch Room:							
(a) Lunch room							
(b) Kitchen							
(c) Store rooms							
(d) Dressing rooms							
13. Teachers' Rest Room							
14. Teachers' Lunch Room							
15. Corridors:							
(a) Corridors							
(b) Stairways							
(c) Entrances				Total			
				% Overhead			
Sub Total				Grand Total			

Date of Survey__________

By__________

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SCORE CARD

REPAIRS AND IMPROVEMENTS (REHABILITATION)

MINNEAPOLIS PUBLIC SCHOOLS OFFICE OF THE BUSINESS SUPERINTENDENT

VIII. ROOFING AND SHEET METAL WORK

	Ultimate Require-ments	R = R&I B = Bonds Request for Year 19	19		Ultimate Require-ments	R = R&I B = Bonds Request for Year 19	19
1. Roofing—Tin and Galvanized Iron:				Amount Forward			
(a) Main roof:				14. Steam Table and Steam Pan			
(1) Tin				15. Piping Off Dish Washer			
(2) Galvanized iron				16. Domestic Science Table Tops:			
(b) Gutters:				(a) Monel metal			
(1) Tin				(b) Galvanized iron			
(2) Galvanized iron				(c) Tin			
(c) Conductor pipes:				17. Splash Backs—Sinks			
(1) Galvanized iron cond. pipes				18. Soap Shelf			
(2) Galvanized elbows				19. Sand Boxes:			
(d) Wall flashing				(a) Aluminum			
(e) Wall coping				(b) Monel metal			
(f) Ventilators				(c) Galvanized iron			
(g) Skylights				20. Flag Poles			
(h) Scuttle covers				21. Doors:			
(i) Roof strainers				(a) Metal covered doors			
(j) Painting—all roof work				(b) Metal covered door frames			
2. Roofing—Gravel				(c) All metal doors			
3. Roofing—Asphalt				(d) All metal door frames			
4. Roofing—Tile				22. Pot Sinks			
5. Roofing—Slate				23. Silver Sinks			
6. Roofing—Corrugated Iron				24. Vegetable Sinks			
7. Ventilation:				25. Potato Peeler Pails			
(a) Fresh air intake chamber				26. Floor Strainers			
(b) Foul air discharge chamber				27. Scrapping Tables—Metal Covered			
(c) Fresh air duct work				28. Soldering Benches—Metal Covered			
(d) Foul air duct work				29. Staining Benches—Metal Covered			
(e) Toilet room vents				30. Wet Stone Benches—Metal Covered			
(f) Gas stove vents				31. Machine Guards			
(g) Diffusers and deflectors							
(h) Hand controlled dampers							
8. Steel Lockers							
9. Steel Cabinets							
10. Air Washer Tanks							
11. Toilet Tanks							
12. Boiler Breeching				Total			
13. Piping Off Hot Water Boiler				% Overhead			
Sub Total				Grand Total			

Problems of Planning Additions to Schoolhouses

As Illustrated in the Des Moines Building Program

BY A. W. MERRILL

ASSISTANT SUPERINTENDENT, DES MOINES PUBLIC SCHOOLS

AS a part of a seven-million-dollar building program, now about completed, the School District of Des Moines, Iowa, has recently made additions to twenty-three elementary school buildings. No doubt, some of the difficulties encountered in planning these additions are sufficiently typical to give some general interest to a discussion of them and of their handling.

None of the original buildings appeared to have been planned with a view to other than the most limited expansion. Many of them seemed designed to preclude any enlargement whatever. Since the buildings were small and the addition contemplated not large, it was certain that still further expansion would sometime be necessary. Thus the problem was to make, of buildings not well designed toward that end, a first unit of a large school plant, the second unit of which was now to be constructed.

Elements of Difficulty

Necessarily, a serious factor in such a problem always will be the more or less constant change which is bound to occur in theories of school organization. However temporary they may be, educational policies reflect themselves in school buildings. In Des Moines the various elementary buildings represented several quite distinct eras of administrative policy, and it was a very serious question how to remodel these structures so that they would not again be set in the mold of another temporary stage of educational development.

Another element of difficulty lay in peculiar fashions of schoolhouse planning which had from time to time seized the fancy of former school boards. At one time the favorite plan called for a great central stairway surrounded by schoolrooms on two or three floors. Later the idea developed of a square building with a room at each corner entered from a square hall in the center, entrance and stairways occupying spaces between the rooms, windows placed on every side of the building (see Plate I). The newer schoolhouses contained the long corridor with unilaterally lighted rooms along each side which can so easily be made to insure the possibility of indefinite expansion, but in nearly every case some ingenious device had been found to prevent or hinder, on at least one floor, the continuation for any distance of this main corridor (Plates II and III).

The size, shape and topography of school grounds, and the location of the school building thereon, constituted the next most important factor in the problem. In several cases that side of the building which offered the best opportunity for attaching an addition was the side which faced and was close to a main thoroughfare or property of prohibitive cost. In others the building was so placed that the natural development would seriously injure a valuable playground. Most peculiar was the fact that very many of these buildings had their main floor six or seven feet above ground level, with a basement sufficiently deep in the ground to make its proper lighting almost impossible. During the war Des Moines had grown very rapidly, and these basements had been converted into schoolrooms, damp, dark and dismal, thus creating a public sentiment which demanded the avoidance of any possibility of similar conditions in the new construction. In a few cases the topography of the property was such that the building could be so extended as, in the addition, to convert the basement into a ground floor, but on level ground some other scheme was necessary.

At the very beginning of the building program the general rule was laid down that all additions planned must not only avoid mistakes made in the past such as those just mentioned, but must also, so far as possible, tend to eliminate from the resulting structure the weaknesses then existing. In working out this general rule, principles and standards were developed and applied of which there is space to illustrate only a few in the following account of some concrete situations. Discussion of the more important of these principles and standards will be postponed to the conclusion of this paper.

An Interesting Problem—Plate I

By far the most interesting and perhaps the most difficult concrete problem that confronted us concerned a group of eight-room buildings, all of about the same floor plan, of the type heretofore described as having a room on each corner with a central hall. For purposes of illustration one of these is selected which was located in the center of a small site which has a street on every side (Plate I).

Every classroom in this building has windows on one side and end. The construction is such that to provide sufficient unilateral lighting would be very expensive. There is a basement just deep enough in the ground to be too dark for school purposes. The ground is level. Fortunately, the street in the rear (to the west) is one which can be vacated. The others are important thoroughfares.

In the case of every building of this type the

device was used of carrying a corridor out from the ground-level landing of one of the side stairways, extending this corridor far enough to protect the lighting of the rooms on that side of the original building. In this way the basement floor disappears in the addition without making the change of floor levels conspicuous in the interior. The problem of exterior design is met by a compromise between the former rather ornate style and the plain modern design, which tends to distinguish the addition as a separate structure.

In this particular situation, because of the small lot, the second device was employed of turning the corridor toward the direction in which future expansion must occur. In our experience the development of an L or U type of building is often the only solution to the problem presented by the poor location of a building with relation to the lot boundaries. The alternative would have been to extend a corridor out to the rear, where the old toilets are located, but this would have made the change of floor levels more of a problem.

The corridor required to connect the addition to the old portion without interfering with the natural lighting of the latter proved to be a very expensive feature, but no other scheme could be devised which did not involve almost an entire reconstruction of the original building.

Another Sort of Problem—Plate II

A different sort of problem was encountered with a group of more modern buildings in which rooms were arranged on each side of a long corridor. In one of these, a typical floor plan of which is shown on Plate II, the situation was complicated particularly by two facts: (1) that the south end of the building was only sixty feet from the lot line; (2) that on the north end of the building, on the basement floor, there was a large so-called community room lighted from the north. This room it was desirable to preserve for the present as a makeshift gymnasium, because the appropriation was too small to provide a new standard gymnasium in addition to the other rooms absolutely necessary.

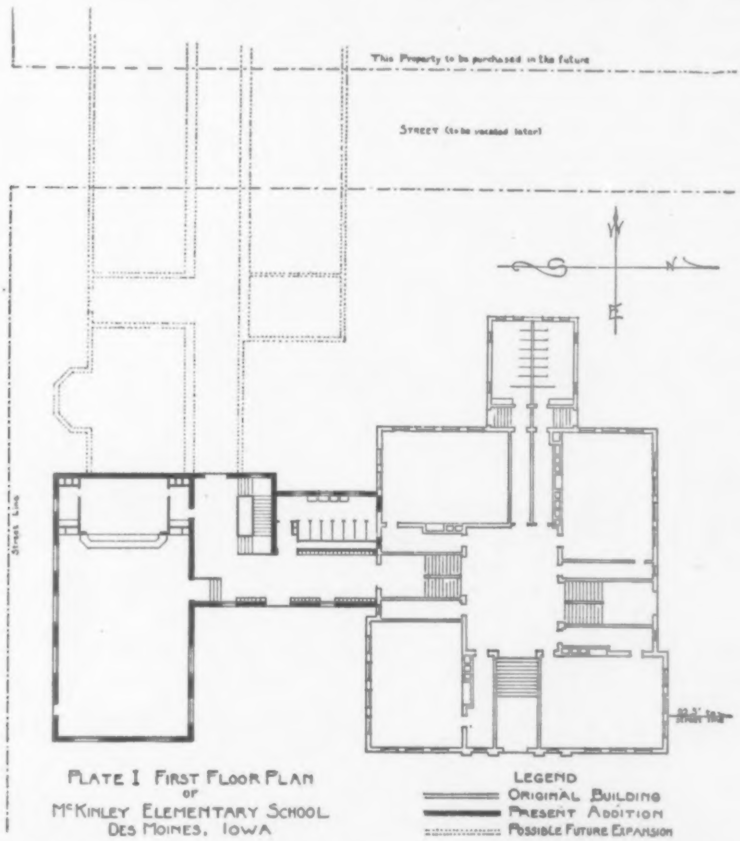


PLATE I FIRST FLOOR PLAN OF McKINLEY ELEMENTARY SCHOOL DES MOINES, IOWA

This and the other two plates in this article are reproduced at a scale of 1-48 inch to 1 foot.

This building was of two stories with rather high basement, situated upon a low knoll such that, with some little regrading, the basement floor level is above ground as the building is extended either to the north or south. The property is of good size and the neighborhood such that in the future a large building will certainly be required.

The rather peculiar floor plan shown on Plate II

was adopted because (a) it makes possible one of our standard elementary auditoriums (capacity 240) on the upper floor, over the south and southwest classrooms and the short corridor leading to the latter; (b) it makes practicable considerable expansion on the south end of the building before the more difficult extension toward the north is worked out; and (c) it provides the seven rooms needed at that time at a considerably less expense than any one of several alternative schemes that were suggested by the architects.

A Quite Different Treatment—Plate III

A somewhat similar building in another location appeared to require quite different treatment, as shown by Plate III. In this case extension directly toward the south was impossible because of a street, while within thirty feet of the north end the ground dropped abruptly to a sunken playground about twelve feet below street level. This building also has a basement, but as in the previous case is so located that the basement becomes the ground floor as expansion is carried to the west.

Because of the sunken playground, the addition to the north, with a gymnasium in the basement which has its floor on a level with this playground, was definitely planned to end development in this direction. The community room in the south end of the basement—typical of many of our old buildings—is shown in the sketch of the typical floor plan. Since a standard elementary auditorium is placed in the present addition over the standard gymnasium—both of these being planned for community as well as school use—there is no need to retain this large room; therefore, the space it occupies is used for two standard classrooms, as well as to provide part of the space required to lead a future corridor out toward the west.

The three cases described have been chosen as somewhat typical, but suggest the general nature of the situations met rather than illustrate fully the extent of the difficulties encountered. For lack of space it is necessary to omit further discussion of concrete instances.

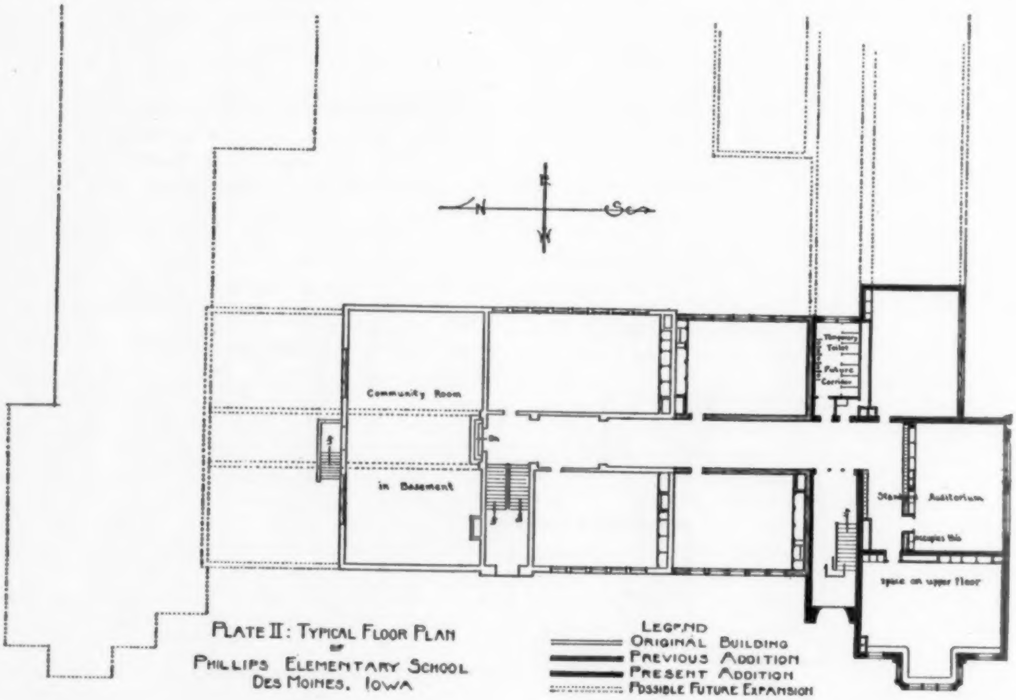


PLATE II: TYPICAL FLOOR PLAN OF PHILLIPS ELEMENTARY SCHOOL DES MOINES, IOWA

General Lessons Learned

A number of the general lessons learned may be of value to others. Some of these, as already mentioned, took form in principles that were applied in the conduct of the building program; others are more of the nature of conclusions reached as the result of the entire experience. A few of the more important of these lessons will be summarized here.

Every piece of schoolhouse planning should include the farthest possible look into the future. There should be a survey of the district to be served, of the probable trends of growth and character of population, and of the need for future extension of school grounds and the directions in which extension is possible. Preliminary sketches should provide for almost indefinite expansion of the building and the exact relation of such possible growth to the grounds. We shall never be able to determine how great future needs may be.

The size, shape, arrangement and detailed plan

of all rooms in the building should be carefully worked out in conformity with current educational thought, but with constant attention to the need of such flexibility of use that there may be every chance of easy adaptability to changing theories and policies. There is no possibility of anticipating what the future may bring forth in education any more than in other lines, but our buildings should be so planned that they are likely to offer the fewest possible obstacles to progress.

The arrangement of the interior of the building, including all such details as the proper placing and size of windows, should never be sacrificed to exterior design. Educational ideals and requirements should dictate the plan; the designer should be required to show his skill by making the necessary features attractive on the exterior.

Architects should also be required to produce exterior designs sufficiently conservative to reduce the chance of incongruity as additions are made even twenty or thirty years later. Sketches should be prepared and filed giving suggestions of exterior elevations and of ground development at several steps in the enlargement of the building. Materials should be chosen with a view to their availability in the future.

Unless the planning and building of schoolhouses is to remain the comedy of errors that we found it to have been in Des Moines for a quarter of a century, the direct supervision of such work must come to be looked upon as a job for an experienced educator. Nor can it be included as simply one of the many duties of a school superintendent. The work can be well done only by one who knows much of actual building practice and of the problems of construction. With this he must know educational theory and have some actual experience in school administration and supervision. Even so, his success will depend very largely upon the patience and sympathy with which he is able and willing to take into consideration the interests and the opinions of architects, engineers, contractors, material men and practical workers in all lines as well as of those engaged in the many phases of education. The wisdom of no one person should be considered sufficient in so stupendous a piece of creation as is the whole process of schoolhouse construction. Final judgments should be made by one who gives educational considerations greatest weight but who is willing to accept the value of every possible contributing source of knowledge.

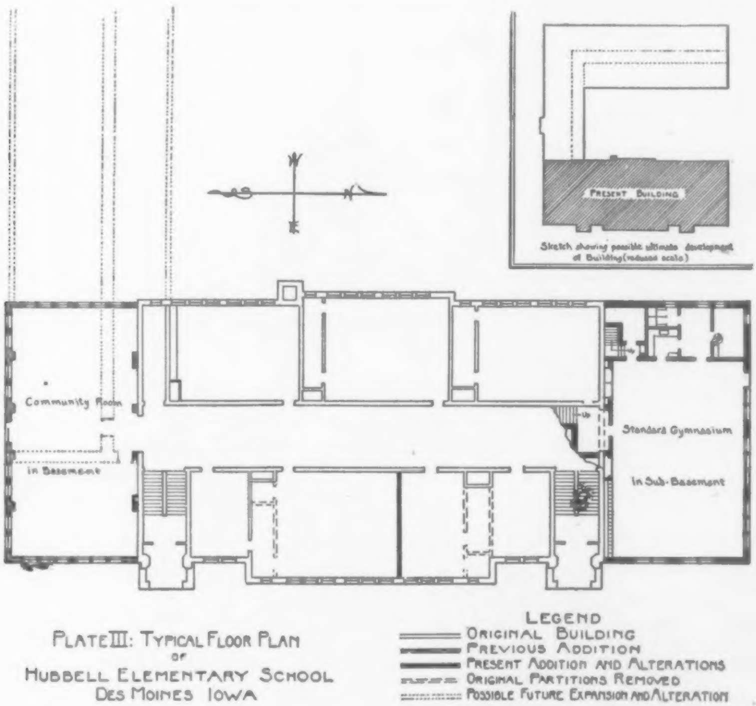


PLATE III: TYPICAL FLOOR PLAN OF HUBBELL ELEMENTARY SCHOOL DES MOINES IOWA

The relation of school building, planning and construction to the efficiency of teaching is much closer than is generally supposed. Therefore, the details of the building process are much more important than they have been considered to be. Schoolhouses must not be built with the notion that educational processes can easily be adjusted to the building in which they are to take place. Instead, if economy and efficiency in education are of any value whatever, the building must be planned and erected, from start to finish, in harmony with, and as a means to, the activities and aims of the educational work that is to be undertaken therein.

Modern Trends in Schoolhouse Painting and Decoration

BY G. B. HECKEL

SECRETARY, AMERICAN PAINT AND VARNISH MANUFACTURERS' ASSOCIATION, INC.

DURING 1917-1918, I contributed to the *American School Board Journal* a series of articles under the general title, "Painting the School House," in which I attempted to trace tendencies and developments up to that time.

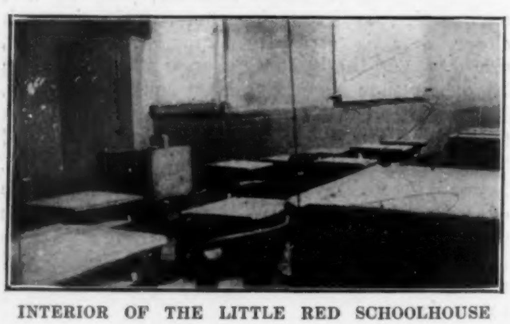
All schoolhouses and all schoolhouse painting in America trace back to "the little red schoolhouse," memory of which Henry Ford has recently revived by his purchase of the "oldest survivor," at Sudbury, Mass.

Of this great-grandfather of all schools I wrote:

"The 'little red schoolhouse' is little because the people who provide it are too ignorant to comprehend the meaning or the office of a school. It is 'red' because red paint is the cheapest of paint products and because those responsible for its application have no sense of taste or fitness. Red mineral paint is among the most durable of all our paint products, and has its own important place—but not here. Along with the equipment of the 'little red schoolhouse' go the mean little textbook, written by men innocent of literary talent, sympathetic understanding or sense of proportion; and the underpaid teacher, selected without comprehension, and held to a curriculum without object or result."

Our forebears, while thoroughly sound in their appreciation of the importance of education, were not only puritanical in their ideas of decoration, but woefully lacking in a knowledge of the principles of illumination and the psychology of color. Mentally, they associated pleasure with sin—there must be something inherently wrong with anything easily and comfortably acquired. So they made the road to learning a thorny path, and its surroundings properly austere and penitential.

THE ANCIENT LITTLE RED SCHOOLHOUSE
Purchased by Henry Ford



INTERIOR OF THE LITTLE RED SCHOOLHOUSE

By the time those articles were written, school architecture had, of course, improved in keeping with the progress of the country; but most of the school interiors were still painted white, and color was generally eschewed.

This adherence to ancient custom was not, however, without some scientific justification. Some thirty years earlier Dr. Samuel D. Risley, who became famous as an ophthalmologist, made a survey of the eyes of public school children of Philadelphia, and found widespread disorders which he traced directly to deficient illumination. These findings had a wide influence throughout the country, and the extravagant use of white on school interiors prevailed during several decades following.

In recent years better understanding of the principles of illumination, due to the researches of Dr. Luckeisch, Henry A. Gardner and others, have given us a clearer comprehension of the entire subject, in showing that effective illumination is a product of the intensity of the light received and of the reflecting efficiency of the surface on which it falls. A white surface has the highest reflecting value, but if we increase the intensity of the light received, we may decrease the efficiency of the reflecting surface and still maintain the same degree of effective illumination.

An exact understanding of this general principle has opened the way to a more pleasing style of treatment, which is admirably illustrated in much recent work.

Utilizing the Psychological Influence of Colors

Many careful researches have shown that colors have a psychological influence, which can and should be utilized. Because the sky, and the ocean generally, are blue, and the trees and the fields green, these are to us quieting colors; and because blood is red, fire red and yellow, the sun yellow or red, and the sands yellow, these intense colors are disturbing and disquieting. These bald statements may sound far-fetched, but their essential validity has been demonstrated. The tendency of modern schoolroom painting is therefore towards a liberal use of tints of blue and green and a more sparing use of the tints of yellow and red.

FIRST FLOOR CORRIDOR OF THE LINCOLN SCHOOL, EVANSTON, ILL.

In any case, the recent universal trend towards color—often riotous color—could not have been stemmed by the schoolroom decorator. Hence, modern schoolrooms have abruptly broken with tradition, and the ghastly white schoolroom wall is rapidly becoming a mere tradition.

A recent example is the Edgewood Kindergarten, a parochial school under the Dominican Sisters, at Madison, Wis., where the walls are finished in Nile green and ivory; where, to compensate for the reduction in reflecting value, the windows are large, and the electric lighting units correspondingly increased.

Another recent example is the Lincoln School, at Evanston, Ill., where color is liberally used throughout, not only in plain, solid tints, but also in mottled colors and tints which stimulate interest.

Here again, the illumination is so designed as to compensate for the decrease in reflective capacity.

In general, flat paints are preferred to lustrous surfaces, since the former afford a more diffused illumination, free from alternating points of high and low intensity.

Wherever we look, we find color and consequent cheerfulness in the ascendency. No longer is the schoolroom treated as a penal or disciplinary institution. The tendency is to make learning a pleasure and its temple inviting.

Color on School Exteriors

A corresponding development is apparent in the treatment of exteriors. Concrete is a preferred building material, and is perhaps the most enduring of all such materials available. But it has its drawbacks. Uncoated cement, whether as concrete or as stucco, readily absorbs moisture, and, in the case of the latter, sometimes in sufficient quantity to attack the steel framework on which it is laid. In any case, however, alternate wetting and freezing develops fine surface cracks and discoloration from air-borne dust. The common practice is therefore to paint concrete structures with oil paint, thus excluding moisture and preventing discoloration.

This practice opens the way for pleasing decorative effects in the use and distribution of color in flat ornamentation, as is illustrated in great profusion and variety throughout Southern California and more sparingly elsewhere.

The modern trend is decidedly towards a more and more liberal use of color—a trend which is apparently only at its beginning.

"EDUCATION INSPIRES YOUTH"—ONE OF A SERIES OF MURAL PAINTINGS BY GEORGE LAURENCE NELSON, IN PUBLIC SCHOOL 55, BRONX, NEW YORK CITY

Photograph by courtesy of the Sherwin-Williams Co.

A WELL LIGHTED, DECORATED AND FURNISHED KINDERGARTEN ROOM

CLUB ROOM, TOYON HALL, LELAND STANFORD UNIVERSITY

Photographs by courtesy of Hockaday, Inc.

ONE OF THE CORRIDORS LEADING FROM KITCHEN TO DINING-ROOMS, LELAND STANFORD UNIVERSITY

Functions and Methods of a University Purchasing Department

BY GEORGE S. FRANK

MANAGER OF PURCHASES, CORNELL UNIVERSITY

IT is fitting that educational institutions should be vitally interested in the organization and operation of properly functioning purchasing departments. Purchasing today is both a scientific and an engineering problem: scientific because accurate knowledge is required, and engineering because it deals in economics. Regulated and right buying is a study in economics.

The need for such a department, where it does not already exist, is sufficiently evidenced by the many advantages that have accrued to those institutions of learning which now have centralized their buying under one management. In the first place, centralization will bring about a reduction in personnel. This is obvious, since duplication of effort is eliminated. In the second place, it brings about quantity purchasing with its attendant economy and necessary standardization. It allows for the pooling of orders for similar commodities, the centralization of correspondence, the selection of a higher standard of materials, the prompt handling of adjustments and claims, and uniformity in inquiries and quotations. It brings about an improvement in purchasing methods and submits each transaction to the test of criticism. It makes possible, because of the volume handled, research and investigation of commodity sources, qualities of products and comparative values; and, finally, it results in the accumulation of a fund of information and experience which is available for application to each individual daily problem.

Most of our great universities have passed through the organization period and have established offices charged with centralizing purchases for the various departments of instruction and administration. Secondary schools and boards of education have followed suit, until there is widespread interest in the problems connected with administering such a department.

It should be appreciated that actual buying is but one function of a purchasing department. To such a department are usually assigned such duties as the receipt and inspection of material, the checking and approval of invoices, tracing shipments and preventing delays in transit, the operation of a storehouse, settling claims, assisting with inventories, handling import shipments and customs transactions, and keeping informed regarding the countless variety of items which may be needed by the departments of a great educational institution. It is self-evident that there must be many specific advantages to be gained by commissioning this buying department to study the various problems, allied to purchasing, outlined above.

Purchasing procedure, as far as routine is concerned, is so well standardized and has been so well covered in articles previously published that it is not necessary to repeat the formula by which a requisition becomes an order, and an order secures the delivery of needed items at the proper time and place. What may be of interest is some enlargement on the subject of some of the less familiar functions of the department.

Keeping Well Informed

Probably the most important task of any purchasing department is that of keeping well informed. Of all the tangible assets of its staff, none is so important as experience. This is gained not only in the process of the day's routine, but through constant study of sources of information bearing on the work of the department. A broader knowledge than merely that of buying-routine is essential. This includes economics, and a general knowledge of business, including the problems of organization and management, market conditions, production problems, distribution and, especially, salesmanship.

The purchasing agent should strive to know more about the value of the principal commodities he is called upon to buy than the salesmen who try to sell them to him. He should know the approximate cost of producing these items, together with the market price of the raw materials used. Then, assuming he is informed regarding the cost of distribution, he is able in advance of a purchase to have pretty clearly in mind a figure which represents a fair price for the item in question. Records of past prices and current quotations, supplemented by a study of market changes, represent the kind of information which must be the basis for most of the decisions made by the purchasing department.

As to sources of information, past records of course are of prime importance, and these should be so preserved as to be readily accessible. Data on sources of supply should be as complete as possible, because in educational work the variety of items required is almost unlimited. THE AMERICAN SCHOOL AND UNIVERSITY, commercial registers, telephone directories, magazine advertisements, trade publications, manufacturers' catalogs and pamphlets, are mentioned merely to point out the extent of sources of information essential for reference. A catalog file should be orderly, complete, up-to-date and cross-indexed. Supplementing it should be an information file for current quotations, pamphlets and descriptive matter. In addi-

tion, most purchasing offices have a file of specifications, a small library of publications in the purchasing field, and a cabinet for samples submitted for test or accepted as standard. Simplified practice recommendations of the Department of Commerce and Willing-to-Certify lists from the Bureau of Standards are also helpful. Briefly, the purchasing department should become a clearing-house for information of all sorts, so that unwise purchases will not be duplicated and reports of satisfactory products will be made immediately available for general use.

Storeroom and Stock Control

Only through adequate storeroom facilities can the greatest advantage of quantity purchasing be realized, and the greatest contribution to the efficiency of such a storeroom is an accurate stock control. Volumes have been written on storeroom operation, and little of value can be added in connection with the routine operations generally adopted. The great importance of stock-control records, however, is receiving considerable attention at the present time, and it is vital that university purchasing agents should give this matter the consideration and attention it deserves.

A stock-control system should serve as a complete record of every purchase made and every issue of each commodity stocked in the storeroom. It should be designed to serve as a perpetual inventory and be adapted for listing quotations received between purchasing dates. Not only can it then be used to control the ordering of stores items, but it is invaluable in furnishing data for checking material-received reports, for tracing delayed shipments, for promptly approving invoices and advising disposition of incoming shipments.

It is of course important that any stock record be kept up to date. This obvious statement is made because if it is not rigidly adhered to, the record as a stock control is valueless. Granted that this is done, purchasing for storeroom stock becomes a relatively simple equation from which the unknown quantities have been eliminated; there is no question as to the logical source of supply, the proper quantity to be ordered, and the necessary time for a supply to be received. If this record is kept on modern visible card-records, all the above information, together with the exact quantity on hand, is available to the purchasing agent in the time it takes to reach the record clerk by telephone.

As an evidence of the general recognition of the importance of this problem, the Department of Commerce through its Domestic Commerce Division has within the year distributed a bulletin covering its application to merchandisers and entitled, "Retail Profits Through Stock Control." One of the advantages resulting from the use of a stock control as pointed out in this publication is the tendency toward the elimination of obsolete, seldom-used and non-standard items, which is fostered still further by cooperation.

Advantages of Centralized Buying

Centralization of buying for universities is not confined to purchases made within one educational institution, but the colleges, like the hotels and hospitals, have grouped themselves into an association with nearly two hundred representatives. Many cities and states, as well as the Federal Government, have their centralized purchasing offices where contracts are made covering the needs of the large number of departments connected with governmental activities.

With quantity buying come many advantages to the buyer. Competition is keen because his business is worth-while. A large purchaser is in a position to demand and receive exactly what he specifies and, if his purchases are large enough, he has the facilities for research and testing which enable him to secure the very best quality for his particular needs. The phenomenal success of the great mail-order houses and chain-stores is due largely to their great buying power.

In a recent issue of *Nation's Business* the editor pointed out that more and more, business is beginning to find out what is needed and then making it, rather than making what it pleases and then trying to sell it. This change has been brought about by the activity of large buyers who have sufficient buying power to demand and receive what they want.

Another trend in buying is toward the use of specifications, especially those stipulating performance rather than components and structure. Editorial comment in *The Purchasing Agent* for March was to the effect that the current development is clearly towards a greater volume of buying to specifications and towards making performance the major stipulation in specifications. Dr. A. S. McAllister, of the National Bureau of Standards, recently has written an illuminating article on this subject, published in *The Purchasor*.

It is apparent to any one studying the development of purchasing practice, not only in the educational field but throughout industry, that changes and better methods constantly are being brought about, and that interesting and valuable suggestions unheard of a year ago are being adopted today. So any outline of present approved procedure must be accepted with an attitude receptive to constructive changes which will come in the future, and must be flexible enough to allow the adoption of frequent improvements.

Some Social and Economic Aspects of School Fires and Fire Insurance

BY STANLEY C. OLIVER

GRADUATE STUDENT IN EDUCATIONAL ADMINISTRATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

WHAT are the losses incident to any school fire? This question cannot be answered by a simple statement of the property loss expressed in dollars. There are some fire losses which can be expressed in dollars, but there are many other losses which can be expressed only partially in the coin of any nation. Fire losses have effects which are not apparent to the casual observer, as will be pointed out in a later paragraph.

The total of the public school, parochial school, college and state teacher college property losses is immense. The 1928 Fire Prevention Year Book contains a list of 551 school fires which occurred between May 12, 1915, and June 26, 1928. The aggregate loss caused by these 551 fires amounted to $35,000,000.* However, this list includes only a small fraction of the total number of the school fires which occurred during those years. It is estimated that there are five of them each day during the entire year, or a total for each year of over 1,800 fires.

Fire Protection for Educational Buildings

was discussed in the edition of THE AMERICAN SCHOOL AND UNIVERSITY *for 1928-1929 (pages 54-60) by Robert S. Moulton, Technical Secretary, National Fire Protection Association. Mr. Moulton's article emphasized the fact that a shell of brickwork does not make a school fireproof, and outlined important features of the Buildings Exits Code issued by his Association and embodied also in the National Education Association's publication on "Schoolhouse Planning."*

Fortunately, many of these 1,800 fires cause a relatively small amount of damage. The one-room rural schools, which number about 161,000 in the United States, are the scene of many fires. The sum of the value of the property destroyed by all the small fires, plus the larger fires which were not included in the list of 551 major school fires, would amount to a staggering total. Some idea of the loss produced by all the small fires may be obtained from the fact that 46 per cent of all the school property fire loss sustained by the city of New York during a period of five years was due to small fires.

Money is only one of several standards by which school fire losses should be measured. Loss of life is one standard. The 551 fires previously mentioned caused the loss of 110 lives, most of which were the lives of school children or teachers. The value of the life of a child can not be measured in money.

A fire destroys much that can not be replaced. Treasured pictures, rare collections of minerals, plants, and similar materials; carefully selected rare library books, and athletic trophies, cannot be replaced, for they are the product of the endeavors of many persons over a period of many years. A city near New York possesses a collection of extremely valuable original documents relating to the occupation of the community by Washington and his army. This collection is housed in the public library, which is controlled by the Board of Education. The building is a fire-trap. This unreplaceable collection of historical documents is in daily danger of being destroyed, for it is not stored in fireproof vaults, as it should be protected. The same potential danger lurks in nearly every public building, although seldom to the same extent as in the above-mentioned case.

Many of the ordinary school documents in every-day use could not be replaced if destroyed. It is a well-recognized fact that the destruction of financial records may entail heavy financial losses. Yet financial records are frequently not protected in school buildings, and it is not uncommon to find that some of them are kept in the homes of school-board officials, where the protection is decidedly less. Pupil records are of great value to each of many individuals. These records are necessary in the proper placement and guidance of the pupils in school. The graduate of the school frequently needs to use the school records in order to matriculate in a higher school, in order to secure a position, or in order to secure certificates of various sorts, such as a teacher's certificate. If the school's records have been destroyed, the pupil may experience financial loss, and certainly inconvenience, as the result of this destruction. The importance of records of all kinds demands their careful protection from fire.

The destruction of historic buildings, those landmarks around which have grown up traditions handed down from one generation of students to the next, means the destruction of intangible values, never to be replaced. Much of the well-being of any institution is dependent on the sentiments and traditions which govern its student

* The 1928 Fire Prevention Year Book, *Baltimore Underwriter.*

FIRE DESTROYS HIGH SCHOOL AT MONROE, N. Y.

Despite the efforts of local fire apparatus and that of many surrounding towns, fire destroyed the high school at Monroe, N. Y. The loss was about $200,000

BOYS FLEE FOR LIVES AS FIRE DESTROYS PREPARATORY SCHOOL DORMITORY

Dawes House, the largest dormitory at Lawrenceville School, Lawrenceville, N. J., was destroyed early January 19 in a spectacular fire that sent the students fleeing for their lives in their underclothes. The loss was placed at $100,000

body. The destruction of old habits and customs is a matter of grave concern.

Handicapping Educational and Civic Progress

A heavy school fire loss not infrequently delays or prevents growth and improvement in that educational system. Each institution has a certain amount of wealth on which it can draw. If the institution is compelled to draw heavily on its resources to replace losses caused by fires, to that extent it is less able to embark on new projects for promoting growth or improvement. There is a limit to the amount of money any community can pay in taxes. If a debt remained to be paid when the building was destroyed, it is entirely possible that the replacement building will be inferior to the destroyed building.

The undue requirements of any one phase of civic endeavor will limit the activities of other civic enterprises. The Institute of Social and Religious Research, in its study of American villages, found many communities in which all civic progress had been halted by the cost of erecting excessively elaborate churches, school buildings, or other enterprises. In other communities the expense of replacing buildings which had been destroyed by fire prevented the meeting of other civic needs, such as hospitals and recreational centers.

The effects of the cost of replacing a burned school building with a new structure, on the economic, social, and civic progress of a community, is demonstrated by the following case study. The pertinent facts have been taken from a sociological survey which was made of a Mid-Western borough. As the results of this survey have not been published, the borough under discussion will be called A——.

What Happened in Borough A——

A——'s burned school building, while it was not modern, was fairly satisfactory. It was becoming somewhat crowded because of rapid increase in the enrollment. Insurance in force at the time of the fire amounted to 20 per cent of the estimated sound value of the building. The insurance indemnity amounted to $15,000.

The population of the borough was growing rapidly because of several prosperous new industrial plants. All indications pointed to the continued prosperity of the established industries and to the attraction to the borough of several additional manufacturing plants. The school enrollment was 253 grade pupils and 139 high school pupils.

The chief civic and social needs of A—— were a sewage-disposal plant, a recreation center, and a hospital. Plans for a suitable hospital to serve the borough and the large surrounding community had been discussed, and numerous pledges of funds for its erection had been obtained. The need for the sewage-disposal plant was being discussed with growing seriousness. It was at this critical stage in the history of A—— that the school building burned.

The new school building as planned and built was of sufficient size to accommodate the existing enrollment and the expected increase in enrollment during the next few years. The new building contained 43 rooms, counting the auditorium, gymnasium, and basement rooms. The building itself was a modern, well-built school plant. The borough was bonded for $200,000 to pay for the new school building and its equipment.

The social and economic effects of the cost of the new building at once became apparent. In 1921, A——'s tax rate was 6.1 mills, while the average rate for seven other boroughs in the county was 5.02 mills. In 1923, after the new building had been built, A——'s tax rate was 31.25 mills, and only 5.09 mills for the same seven boroughs. The budget estimate for 1924-25 was $44,000, of which $19,460 was allotted to sinking-fund and interest charges. But the best estimate obtainable showed that all the revenues which could be legally collected would amount to not more than $37,000.

The social and economic effects of the crushing debt and high tax rate on the community were profound, as was shown by what took place.

As the result of the sudden five-fold increase in A——'s tax rate, the prospective new industries located in other places. One of the important industrial plants in A—— moved to an adjacent borough to escape from the high taxes. The removal of this industry compelled a number of families to move to other communities, in order that the head of the family might get employment. The merchants and business men felt the pinch of the general depression.

The effect of the debt burden and increased tax rate on the needed and projected social and civic enterprises was decisive. All discussion of the need for the sewage-disposal plant ceased. Plans for the hospital, although the surrounding community was interested in the hospital, were abandoned, and the pledges of money which had been secured were returned to the donors. The churches found it difficult to secure the usual amount of funds on account of the depression.

The effect on the work of the school was disastrous. The people of the community grew to hate the school. Many persons refused to attend any meeting held in the school auditorium, although the auditorium had been planned to meet community needs. Proper school equipment and supplies could not be obtained. The teachers were paid the lowest possible salary permitted by law, with the result that each year saw an almost entirely new teaching staff in charge. The new building is not being cared for in the proper manner. Slight defects have not been repaired, the floors are not properly cared for, and the janitor service is poor. In a few more years the new building will be seriously impaired.

It would be inaccurate to claim that the destruction of the old school building was the entire cause of the present intolerable situation. The Board of Education erred in two respects: first, in having only one-fourth enough insurance

JOHN C. GREEN SCHOOL OF SCIENCE, PRINCETON UNIVERSITY

Fire does not respect cost, beauty or contents of buildings

The photographs reproduced in this article are by P. and A. Photos and International Newsreel

HINGHAM, MASSACHUSETTS, HIGH SCHOOL BURNED—LOSS $75,000

One fireman was injured while trying to save some of the school records

on the old building; and, second, in completing the entire new building when one wing would have been sufficient for the then needs of the community. The exercise of good management by the school board would have limited the bond issue to $100,000, for the insurance indemnity should have been $45,000 larger than it was, while $50,000 need not have been spent at that time for the completion of the building. However, even if the factor of over-building was not present, the two factors of, first, the increased investment in the new building over the old, and, second, the $45,000 insurance indemnity deficiency, would have loaded the borough of A—— with a $145,000 debt. The social effects would have been much the same as they were for the $200,000 debt. A debt of $100,000 would be a serious burden on A——, but not disastrous.

Some persons may argue that the above case is only possible in a very small community. But the same laws hold, in a lesser degree, for larger places. If a city is compelled to bond very heavily, its tax rate must go up substantially. The tax rate became quite high in Highland Park and that fact was an impelling reason for Ford to enlarge his River Rouge plant at the expense of the Highland Park plant for the manufacture of his Model A. The Baldwin Locomotive Company moved its plant away from the heart of Philadelphia to avoid high taxes. If the tax rate threatens to become too high, all growth of civic projects is in danger of being halted, and in some cases retrenchments may be forced upon certain much-used social and civic enterprises.

When College Buildings Burn

The loss to a college or other institution of higher learning caused by the destruction of a building is serious when measured by dollars, as is evidenced by the Princeton and Villanova fires, pictures of which are shown on page 163. If the buildings are fully insured and the institution is wealthy, the financial loss may be replaced with little difficulty. But the historical and other intangible values cannot be replaced.

If the institution is small and not wealthy, it must appeal to its friends for assistance. Its appeals will probably be answered and the building replaced. But for several years that institution cannot successfully appeal again to those same friends for financial assistance in securing more buildings or increasing the endowment. The number of friends any institution has is limited by the services it renders and by its fame. The small institution must appeal to all its friends when it is faced with a major loss. A major loss therefore halts the growth of a small institution.

If the loss occurs in a state-owned educational institution, the state will replace it. But all too often the replaced building will be considered by the members of the legislature as being adequate for the needs of that institution for that year or for a period of years, regardless of how badly an additional building was needed at the time of the fire. Here again, a major fire loss halts all growth.

All educational institutions should be very careful to prevent heavy fire losses. But some losses are bound to occur.

Municipal Insurance—Pro and Con

Even when the most rigid fire precautions are adhered to, a certain number of fires are bound to occur. How may the impact of heavy losses on the community be lessened? The most common way is by distributing the loss through insurance. For insurance, whether carried in a private company or in a mutual insurance company, is a cooperative means by which each of many people in numerous communities absorbs a small amount of any loss which may occur to any member of the company. No one is then compelled to suffer a total loss. There is rarely sufficient justification to warrant owners of property which is liable to destruction by fire, in not belonging to some insurance society.

The question of whether or not a community should insure its school buildings does not permit of the same obvious answer to the same question when asked concerning private property. It may be argued that since the school property is owned by a fairly large group of individuals, each of whom is compelled to pay taxes for the replacement of any property which might be destroyed, it is unnecessary to insure property against loss. If no insurance is carried, there are two ways by which losses incurred may be paid for. First, by increasing the taxes sufficiently to cover the increased expenditures. A modification of this method is to bond the community to meet the emergency and then gradually pay off the bonded indebtedness. The second method is by setting aside a certain amount in the school budget each year as an insurance fund to meet any heavy losses which may occur. Advocates of municipal insurance claim that it is cheaper than insurance in an insurance company.

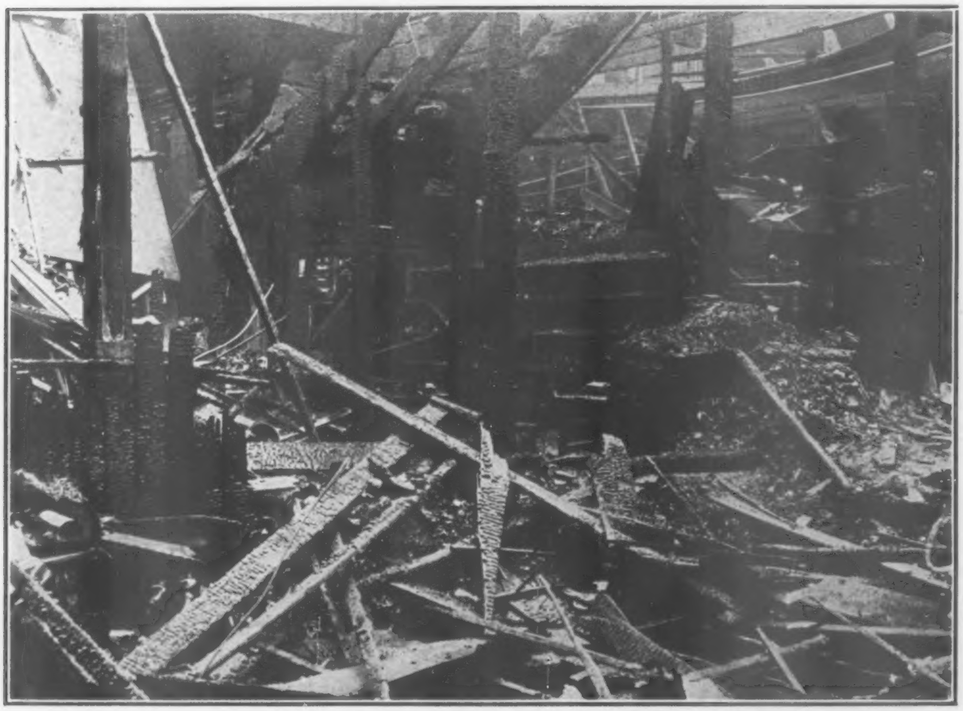
The policy of municipal insurance has proved to be very profitable to the city of New York. Over a period of five years her school property losses were only $64,936, or 0.91 per cent on a sound value of $143,020,145. Insurance on the same amount of property would have cost 11 per cent, or twelve times as much as the total losses. Other data given by Melchior for 1,182 school districts in New York State, exclusive of first-class cities, show that 64.4 cents of each dollar paid for insurance remained with the insurance companies, while 35.6 cents were returned to the communities in the form of indemnities.* But these last data should not be interpreted to mean that every community should insure itself, for there are other factors that must be considered. But the data show that a very large proportion of the money spent for insurance was not returned to the communities.

In the case of Montreal, municipal insurance

* Melchior, W. T.—Insuring Public School Property, page 131.

CHILDREN MARCH THROUGH FIRE!

Led by nuns and lay teachers, 213 pupils of St. Malachy's School, at Atlantic Avenue and Hendrix Street, Brooklyn, N. Y., marched to safety through flames which razed the school. These combustible school buildings should be rapidly replaced with fireproof structures



VIEW OF DAMAGE DONE TO CALIFORNIA HALL, ONE OF THE MOST HISTORIC STRUCTURES OF THE UNIVERSITY OF CALIFORNIA, LOS ANGELES BRANCH

The building was used as a chemical laboratory. The damage was estimated at $100,000

has proved to be very costly. A few years ago Montreal had an insurance fund of $200,000 with which to replace public property destroyed by fire. In the course of a single year three fires destroyed $1,660,000 worth of public property.*

In a large city where the annual school budget amounts to many millions of dollars, it is possible to add a sufficiently large amount to the budget to enable large losses of school property to be replaced and at the same time not to increase the school tax rate. The New York City school budget for 1929 was $130,513,202. The addition of $1,000,000 to replace a school building would increase the school budget by less than one per cent.

Other cities such as Philadelphia and Cincinnati set aside a certain amount in the budget each year to be kept as an insurance fund. After twenty years' time the Philadelphia fund amounted to $350,000 above losses.

The editors of the 1928 Fire Prevention Year Book advance eight arguments why municipal insurance is of doubtful expediency. The arguments may be summarized as follows:

1. The insurance fund must be large enough to take care of the largest risk which is represented by the largest building unit.

2. Two or more buildings may burn in a single year, thus seriously depleting the insurance fund.

3. Fire insurance risks should be widely spread among insurance agencies. It is the practice of fire insurance companies not to assume the entire risk in any one large building.

4. Many years are required in which to build up an insurance fund of sufficient size to replace large building losses.

5. Politics enter into the management of insurance funds in many cities.

6. Experience shows that councils often fail to appropriate the money necessary to continue the insurance funds.

7. Many municipal funds have been lost through unwise investments. Thus accumulated taxpayers' money is lost.

8. If the insurance fund falls far short of covering the replacement cost of a fire loss, the board of education in most cases must bond the community. The amount of the interest on the bonds may be far in excess of the amount of money saved by the non-payment of insurance premiums.

Over against the above arguments may be set the fact that where the unit is very large, as, for example, in New York City or the state of New Jersey, there is a decided saving through self-insurance.

The small community is seldom, if ever, justified in depending on its own resources to replace fire losses. Even the budget of a city of from 50,000 to 100,000 population is too small to allow for the payment for replacement of a building which may cost hundreds of thousands of dollars. The accumulation of an insurance fund is unwise because of the amount of time required and the danger of loss through mismanagement. The businesslike thing to do is to insure in one or more reliable companies.

No board responsible for school property can afford to do without full insurance for its school buildings and their contents. The entire social, civic, and economic life of a community may be seriously affected by heavy burdens imposed by large losses due to school fires which are not indemnified by insurance. And only the large cities are strong enough to carry municipal insurance.

* 1928 Fire Prevention Year Book, *Baltimore Underwriter.*

Self-Insurance for Public School Buildings

BY HARVEY A. SMITH

FORMERLY SUPERINTENDENT OF SCHOOLS, MILLVILLE, N. J.

THE protection of the property for which boards of education are responsible is one of the duties of these officials that have great significance in the eyes of the tax-paying public. It is here that the average layman feels he has sufficient knowledge to judge the efficiency of the board of education, and here, too, as a consequence, there is frequently much criticism of the policies of that body. The adequate performance of this duty of protection of property involves some financial return to those members of the community who are employed to carry out the wishes of the board, and, as is the case in all matters of public concern where money is involved, there is usually much competition for the business that accrues from it, which in turn is frequently the cause of political and other pressure being brought to bear on members of the board of education. In all this conflict of interests it sometimes happens that minor considerations loom large and real purposes are lost sight of. This article is concerned with that phase of property protection and conservation having to do with the fire insurance of public school buildings.

The fire protection of public school buildings involves not only the property of the school district but, what is vastly more important, the lives of the children who attend these schools. Thus in the case of fire protection the board of education has a double responsibility—for the safety of the children and for the protection of school property.

THREE HURT AS SCHOOL IS DESTROYED BY FLAMES

Three students were hurt and several escaped with minor injuries when a blaze of undetermined origin swept the Normal School at Plattsburg, N. Y. Trapped by flames in one end of a corridor and a locked door in another, one of the teachers of the school effected successful rescue of six students by dropping them from a second-story window

THE DESTRUCTION OF COLLEGE HALL, VILLANOVA COLLEGE, VILLANOVA, PA.
The loss was $556,000

There are three types of fire insurance—prevention, self-insurance, and insurance with the companies organized for that purpose.

Insurance by Fire Prevention

The first of these, prevention, should always be practiced whether or not there is any other form of insurance. Any fire means a certain economic loss. The community or individual if insured will receive recompense for the property destroyed, but the economic loss remains because a certain amount of material has been destroyed and this destruction means a definite reduction in resources. Prevention, if it actually functions, will avoid this economic loss, which in the final analysis must be borne by the people.

Self-Insurance

A second type of insurance not so commonly practiced is that of self-insurance. In some cases this self-insurance is accomplished by the school district's setting aside each year a certain amount of money for an insurance fund which is to be used to defray any losses that may occur through fire. Two factors should be taken into consideration before a community should attempt to practice self-insurance. The first of these is that the community should have a sufficiently large number of buildings to warrant self-insurance. This is particularly important, for if there are not many buildings, one fire may mean the loss of a large percentage of the property owned by the community for which there will be no recompense. The second of these factors is that of spread of the risks. This means that the buildings should be located at such a distance from each other that fire in one of them would not endanger another. In case two or more buildings are located so near to each other that a fire in any one of them would endanger others, these buildings should be considered as a unit.

The question of self-insurance as regards public school buildings is entirely one of economy—which means that a city or state contemplating self-insurance should determine from the history of school fires in that city for a period of years what the actual annual loss has been and then balance against that the amount that has been paid to insurance companies for protection. If it appears from a comparison of these two that it will be more economical not to insure, the city is ready to seriously consider self-insurance. However, before entering into it, the two factors previously mentioned must be taken into consideration.

In Self-Insurance the Law of Averages Must Apply

There must be enough school buildings in the district so that the law of averages will apply. An insurance company is able to do business because the risks which it assumes are of so great a number and so widely scattered that it is possible to predict within fairly close limits what percentage of these buildings will be destroyed by fire. It is impossible for an individual to do this. True, he can in the same manner discover the chances that his building will be destroyed by fire, but, what is more important, he cannot tell when or if it will be destroyed. If it is destroyed, the loss will be so great that it will be difficult for him to recover. The insurance company, on the other hand, having determined, from the record of fires, the chances of loss, and having as well a considerable number of buildings insured, can on the payment by the various individuals of a certain sum of money called a premium, guarantee to reimburse them for their losses. The company is enabled to do this simply because it has enough buildings insured to give assurance that the law of averages will work. Because of this collection of risks, the uncertainty of loss on the part of the individual becomes for the insurance company a practical certainty, and it is thus that it is enabled to fix premium rates and sell insurance.

The second factor that must be given consideration is the proper scattering of the risks. Insurance companies regulate this in various ways. They will not, for instance, place more than a certain amount of insurance on any one building, nor will they write more than a certain amount of risks within a city block. In some cases they limit the amount of insurance they will write in any one city. All this is done so that there may be a proper scattering of the risks so that the loss in case of any one fire may not fall too heavily on their particular company. In this scattering of risks the important thing is that there shall not be too great a danger of loss in one particular place.

There is also an economic element in insurance. Allan H. Willett in "The Economic Theory of Risk and Insurance" defines insurance as "that social device for making accumulations to meet uncertain losses of capital which is carried out through the transfer of the risks of many individuals to one person or group of persons." This combination substitutes certain loss for uncertain loss; that is, the individual pays a certain loss or premium to avoid the uncertainty of greater loss through fire. This has economic value because anything that eliminates uncertainty from an industrial or commercial enterprise reduces costs; otherwise, the purchasers would have to pay increased prices because of this uncertainty. However, this economic factor does not operate in the case of insurance of school buildings, since they are not used for commercial enterprises.

Thus we have only two factors to consider in self-insurance of school buildings. One of these, the scattering of risks, is usually well cared for because of the demand that public schools be located so that children need not go any great distance to a school; school buildings are, as a general rule, scattered over the entire city and not grouped in any one place. In the construction of large buildings for the accommodation of senior and junior high schools, however, there is a great deal of risk concentrated in one building, and this would apparently seem to operate

against self-insurance. If these buildings are constructed of fireproof material, which is practically universal in the case of new buildings at the present time, the amount of risk is materially reduced because the probability that a fire in a building of this sort would destroy the entire building is very remote. The amount of risk in this case becomes, not the value of the entire building, but that part of it that might be damaged by any one fire. This matter of concentration of risk may, if a community decides on self-insurance, be lowered by re-insurance, which will be discussed later in this paper.

Securing a Sufficiently Large Unit for Self-Insurance

The other factor of the number of risks necessary for the law of averages to function is the determining factor in the case of self-insurance for school districts. The question is: When is a school district sufficiently large to attempt self-insurance? There are no fixed rules to determine this. The larger cities such as New York, Philadelphia and San Francisco carry their own insurance. In cases of cities of due size where the premiums would in the aggregate reach a large sum and where a new school building is being constructed each year, it is obviously the part of wisdom not to carry insurance. But when the number of risks is decreased, the practice of self-insurance becomes dangerous at a certain point. The problem is not so much to discover where the point is, as to find methods of combining smaller school districts for the purpose of insurance.

Two alternatives are presented in getting a sufficient number of risks to warrant self-insurance. The first of these is to find some equitable means whereby districts may combine and by the payment of certain premiums into a central treasury insure their own school property. This would be analogous to the formation of mutual school insurance companies and would no doubt prove economical because more than 40 cents of every dollar paid in insurance premiums is used to pay overhead expenses. The writer has evolved no plan for doing this, but believes it to be within the range of possibility.

The second alternative is to select a political unit which will be large enough to warrant self-insurance. This plan has the advantage of having in each unit an organization which could be easily adapted to carrying self-insurance for school buildings. The only political unit which is uniformly large enough to justify self-insurance is the state. As pointed out above, it would be comparatively easy to use the present state organization to administer the plan.

The Experience of South Carolina

The state of South Carolina has successfully used this plan for a number of years. The law provided that when the assets in the insurance fund had reached one million dollars, no further premiums would have to be paid on property that had been insured for five years or longer. This limit of accumulation was reached on October 1, 1926, and since then no premiums have been paid except on those buildings erected within the five years previous to that time. The premiums paid average approximately 20 per cent less than the existing fire insurance rates in that state. M. J. Miller, Secretary of the Sinking-Fund Commission in that state, writes as follows concerning the plan:

> "Unquestionably any system that effects a direct saving in the insurance cost on public buildings through writing the insurance at a lower rate, and that in the meantime builds up a reserve of more than one milion dollars, is certainly highly successful. The advantages of this system over ordinary insurance are many. There is nothing socialistic about it. It is merely the organized state government electing to protect its own property against loss or damage arising from fire, lightning or windstorm and setting up a reserve that eventually provides for free insurance protection for the property involved.
>
> "Fire insurance rates are based on the experience of the insuring companies on all property insured by them. Public property should enjoy a lower rate than commercial or residential property, inasmuch as the moral hazard, which is a very considerable item in the insurance business, is almost eliminated in public property. Aside from the saving involved, it enables some central agency, which in this case is this office, to inspect the insured property and make reasonable suggestions as to its improvement as a fire hazard, thereby safeguarding the lives of the inmates and protecting the property."

It should be noted that in order to avoid excessive risks in one place, the state carried a certain amount of re-insurance. This is merely following the practice of the insurance companies themselves.

Re-insurance is that plan whereby an insurance company having too great an amount of insurance in one risk transfers a certain percentage of that insurance to another company and pays it a premium for that protection. This is frequently practiced so that the insurer can place the entire matter in the hands of one company. Matters are thus simplified for him, since he holds only one company responsible in case of loss, which in turn looks to the re-insuring company for protection.

If the experience of South Carolina can be accepted as a criterion, there is no reason why state insurance of public school buildings should not be practicable. In states having very large cities it might be well to allow them to continue to carry their own insurance if they have done so in the past. If the state will charge a premium for a period of years until a reserve fund has been established, it should prove safe from a financial standpoint. After this period no premiums need be charged as long as the reserve remains above a certain fixed sum. In the case of large risks it would be advisable for the state to carry re-insurance.

The overhead costs in the case of state insurance would be materially lower than the 40 per cent charged by the insurance companies, and this saving could be used for inspection and teaching of fire prevention.

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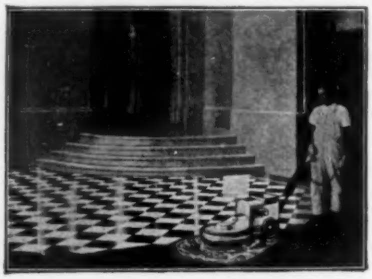

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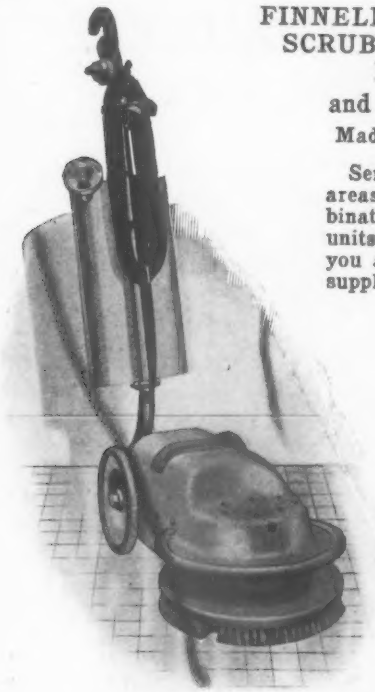

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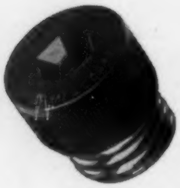

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REX CLEANING CRYSTALS

REX Cleaning Crystals dissolve in water, producing an economical cleaning solution that will serve practically every purpose for which soap is used and many which soap will not take care of. As a strong grease solvent it is especially valuable. Despite its powerful action on grease and dirt it is perfectly harmless to the hands. For use in school cafeterias and for cleaning painted walls, windows or tiled floors, this product has no equal. It leaves no streaks because it cleans without making suds. It works equally well in hard or soft water.

There's a circular on each of these products. Shall we send you the circulars?

THE KENT COMPANY, INC.

Manufacturers of

KENT

Electric Floor Machines

New York Office: 160 5th Avenue — Boston Office: 12 Pearl Street

Main Office and Factory: 110 CANAL ST., ROME, N. Y.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

KENT Electric Floor Machines have been serving hundreds of schools and colleges thruout the country for the past twenty years, doing the daily scrubbing, waxing, polishing, sanding or floor refinishing—lowering cleaning costs—saving time. They make floor care EASY and PLEASANT—doing the work SPEEDILY and with ABSOLUTE THORONESS, at but a fraction of the expense entailed by manual methods.

You simply guide the machine—the motor driven revolving brush, pad or disc does the work. You connect the machine to any electric light or power socket. The machine scrubs SPOTLESSLY clean, waxes THOROLY and polishes to a MIRROR-LIKE finish, or equipped with a steel wire brush and sandpaper disc, it removes old paint and varnish and RENEWS old floors.

KENT Electric Floor Machines are made in three sizes. There's a model to suit your requirements. A trial will convince you.

Model A for use on small floor areas,—brushes 10 inch diameter, weight of machine on brush 35 lbs. UTILITY Model for use on medium floor areas,—brushes 10 inch diameter, weight of machine on brush 65 lbs. JCM Model, a heavier machine, especially adapted for large floor areas,—brushes 12 or 14 inch diameter, weight of machine on brush 85 lbs.

A FEW OF THE HUNDREDS OF SCHOOLS, AND COLLEGES NOW USING THE KENT METHOD OF FLOOR MAINTENANCE

University of Florida, Gainesville, Fla.
Ohio University, Athens, Ohio
Academy Sacred Heart, San Juan, Porto Rico
University of Pennsylvania, Philadelphia, Pa.
Baylor University, Dallas, Tex.
Notre Dame Academy, Chicago, Ill.
Sacred Heart School, Springfield, Mass.
Central College, Pella, Iowa
Castle Heights College, Lebanon, Tenn.
Okmulgee High School, Okmulgee, Okla.
Independent School Dist., Watertown, S. D.
State College of Washington, Pullman, Wash.
Janesville Vocational School, Janesville, Wis.
Beloit College, Beloit, Wis.
St. Mary's College, Brockville, Que., Canada
Board of Education, Clarksdale, Ariz.
Eureka High School, Eureka, Calif.
Loyola College, Montreal, Que., Canada
Michigan State College, E. Lansing, Mich.
Cornell University Medical College, New York, N. Y.
Board of Education, Aurora, Ill.
Board of Education, Pella, Iowa
Lawrence College, Appleton, Wis.
Iowa School for the Deaf, Council Bluffs, Iowa
Associated Students University of Calif., Berkeley, Calif.
Indiana University, Bloomington, Ind.
Board of Education, Shelby, N. C.
Chilocco Indian School, Chilocco, Okla.
Johns Hopkins University, Baltimore, Md.
Harvard University, Cambridge, Mass.
Washington State Normal School, Ellensburg, Wash.
University of Montana, Bozeman, Montana
State University, Norman, Okla.
Lehigh University, Bethlehem, Pa.
University of Washington, Seattle, Wash.

Further details may be obtained by writing for our illustrated booklet.

THE SPENCER TURBINE CO.

HARTFORD, CONNECTICUT

THE SPENCER SYSTEM OF VACUUM CLEANING

The Spencer Multistage Turbine System of Vacuum Cleaning has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Cleaner Schools—For school buildings, the Spencer System has introduced a new standard of cleanliness. Numerous tests have demonstrated that the Spencer System removes 25 to 50 per cent more dirt in pounds under similar conditions than other methods.

No Dust—The Spencer System removed dangerous dust. Even the finest dust is drawn in by large volumes of air under heavy vacuum and goes down to a container in the basement.

Speed—The Spencer System saves time. The Spencer System usually shows a saving of 20 to 30 per cent of the operator's time on bare floors. In cleaning other parts of the school building, however, such as rugs, walls, chalk trays, etc., there can be no comparison. If the janitor were to attempt to clean these parts as well as the Spencer System does, it would require two to ten times as much work!

For Cleaning Erasers and Chalk Trays—The Spencer System, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of the eraser or the chalk tray.

Cleans the Boiler Room—This system cleans boiler room floors—removes dust and soot from pipes and draws soot out of the boiler tubes, often saving the whole cost of operation in this one item alone.

BOOKLET

A number of Spencer-cleaned schools are illustrated in our booklet. A copy of the booklet and a complete list of Spencer-cleaned schools will be sent on request.

CLEANING CLASS-ROOM FLOOR

CLEANING CHALK TRAYS

CLEANING ERASERS

ST 2966

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General Offices and Factories

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Warehouses in Principal Business Centers

TROPICAL

CUSTOM-MADE PAINTS

A Specialized Paint Service for Schools

For years we have specialized in the manufacture of Paints, Enamels, Varnishes and Roof Coatings for the protection of large buildings. During this time we have developed many coatings for Educational Institutions.

The Tropical Surface Saver

From an advertisement in The Saturday Evening Post.

Our whole energy is bent toward the improvement and development of our maintenance products. It pays to buy from specialists like ourselves, because you are sure of getting the most suitable coating for every surface and one which will give long wear and satisfaction.

We maintain a staff of men covering the whole country, who are known as "Tropical Surface Savers". They have been trained in paints and painting problems and know how to analyze painting conditions.

The "Tropical Surface Saver" in your locality will be glad to apply his knowledge to your problems. This is a service of which you can avail yourself free of charge.

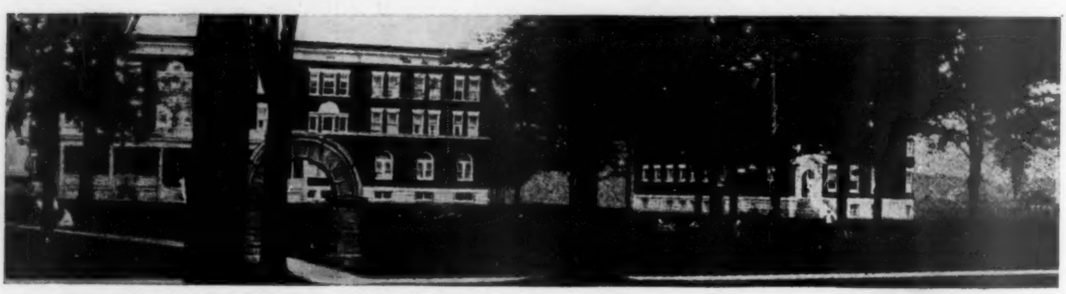
This book, which is given free to school officials, was designed especially to help those who are responsible for the maintenance and upkeep of school buildings.

Among its pages you will find information about protecting and decorating difficult surfaces like swimming pools, shower rooms, laboratories and toilet rooms. It also contains pictures of many educational institutions where Tropical Protective Coatings are now in use, and descriptions of those products, which are designed for school buildings.

Another useful feature of this book is an alphabetical index of all surfaces that need protection around Educational Institutions, and opposite each is the name of the Tropical Product that is designed to decorate and protect that particular surface.

This book will make a valuable addition to your information file, as there are many times when you will find that it will come in handy.

Part of the buildings of the Edinboro State Normal School at Edinboro, Pa. Tropical Products have been used here since 1918



Section IV

LANDSCAPING AND UPKEEP OF SCHOOL GROUNDS

A Directory of Landscape Architects for University and School Projects will be found at the end of this section (pages 180 and 181)

Planning of School Grounds by the Landscape Architect

BY E. S. DRAPER

FELLOW AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS, CHARLOTTE, N. C.

IN the present-day development of the grounds and campuses of schools and colleges the landscape architect plays an important part. While his usefulness is generally conceded in the development of an institutional plan such as is required in the growth of colleges and universities, yet the value of his work in the planning of school grounds is perhaps not so well known. While the problems differ in accordance with the size of the development, the principles of landscape planning remain much the same and include consideration of the practical requirements of the problem as well as the beauty of the completed development.

Why Are School Grounds Increasing in Size?

As is well known, the tracts on which schools are built have constantly increased in size for the past several decades. This is due to several reasons, of which the following are perhaps the most important: (1) the consolidation of schools, due to the influence of motor traffic and the advantages of centralized large schools over a number of smaller schools; (2) the increasing demands of a constantly expanding curriculum, due to the necessity of educating the youth of today more fully and completely than in years past; (3) the realization that proper recreation to be found outdoors on the football, baseball and hockey field is an important factor in building up the health of the children, so that they can get the best results from their educational work.

Today few schools are—or should be—built on less than a five- or ten-acre tract, and many schools, particularly junior and senior high schools, occupy much larger tracts. As the size of the tract to be used for school purposes increases, the general arrangement of the land becomes increasingly important. Where the tract is of considerable size, one or more alternative sites for the principal building may exist, in which case not only is there the question of locating the building in well-studied relationship to the athletic field and other developments of the grounds, together with the approaches, but the question will also arise of advantages pro and con of different sites in relation to the grounds development.

The General Arrangement of the Grounds Most Important

That phase of landscape work which was formerly considered as the major requirement for calling in a landscape architect in the improvement of school grounds—the planting of trees and shrubbery—while still important, is the last item of landscape work to be taken up and is perhaps much less important than the proper arrangement of many features that go to make up a completely developed school ground. Frequently the landscape architect can give important advice as

Robert Wheelwright, Landscape Architect; R. H. Dana, Jr., Architect

VIEW ACROSS THE NEW CAMPUS TO THE ADMINISTRATION BUILDING AND SENIOR DORMITORY, THE GUNNERY SCHOOL, WASHINGTON, CONN.

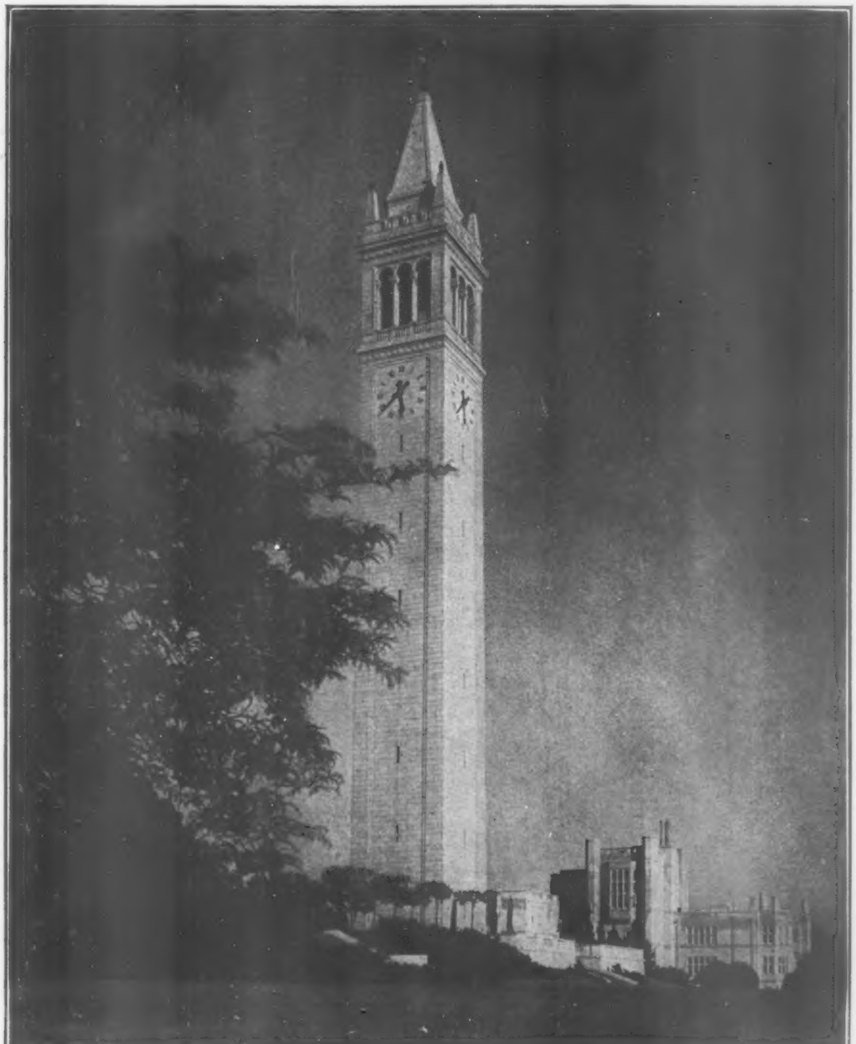
to the suitability of land held under option for the purpose intended, and, whether optioned or purchased, as to the exchange of property to secure suitable boundaries for the completed development. It is the function of the architect to design the building, but it is within the province of the landscape architect to study the general arrangement for the entire development.

The modern school is an educational plant which uses recreational features of the grounds as a part of the school curriculum. Hence, it is quite important that the grounds development be as carefully studied and as well planned as the building itself. More intensive development of school grounds has come about through the fact that in many cities the school grounds after school

ENTRANCE DRIVE TO BARNES MEMORIAL FIELD AND TENNIS COURTS, THE GUNNERY SCHOOL

hours are used as neighborhood playgrounds and, if properly designed, will satisfy a definite need for recreation in the community of which the school is the center.

It has been comforting to many school boards, when criticized for acquisition of tracts of considerable size for school purposes, to realize that land very rarely decreases in value and that the carrying charges on land purchased prior to development are invariably much less than the enhancement in value, if the site be well located, as it should be, in respect to residential growth. So that it is becoming more and more general for far-sighted school boards to anticipate the needs of the community in the way of suitably located land that it is possible to secure for school development.



John W. Gregg, Landscape Architect; John Galen Howard, Architect
SATHER TOWER AND ESPLANADE, UNIVERSITY OF CALIFORNIA, BERKELEY, CALIF.

What the Landscape Architect Must Study

The approach to the problem of school grounds planning by the landscape architect is, first, to find out all the requirements, both present and future, as to school development; then a careful inspection of the site, studying the size of the area in relation to the requirements of development, the character of the topography, and whether or not the required features can be economically constructed, the recreational needs of both school and neighborhood, the relation of cost of landscape construction to maintenance, and other factors of interest. His studies take into consideration suitable site or sites; access by drives and walks; parking and service areas; provision for necessary utilities; proper arrangement

E. S. Draper, Landscape Architect
FRONT CAMPUS, WINTHROP COLLEGE, ROCK HILL, S. C.

of play space, ranging from small open areas to baseball and football fields; provision for school gardens of various types; the beautification of the grounds to secure an attractive setting for the building; and a proper planting development for the property.

In the working-out of these plans the landscape architect first requires a complete topographical survey; after studying this he talks with the architect and the school board, discussing with the board's technical advisor or consultant the various problems to be considered. If the grounds are extensive, the architect may wait until the landscape architect has developed a preliminary plan for arrangement of the grounds before studying the building plans. If the grounds are comparatively small, the landscape architect may wish to await the architect's preliminary plans as to

E. S. Draper, Landscape Architect
VIEW IN A COURT OF RODDEY HALL, SENIOR DORMITORY, WINTHROP COLLEGE

location before studying the approaches and arrangement of the grounds. In one case the landscape plan may affect or even direct the type of building, and in the other the building may control the development of grounds adjacent to it.

Details of the Planning

After preliminary sketches of both the building and the grounds have been prepared, these are presented and approved by the school board and other authorities. Then the architect completes the building plans and specifications, and the landscape architect the grading, planting, and other detail plans. Should the building be planned as a development of units, the landscape architect frequently must adjust his ultimate plan to fit the requirements of the first unit of development, while providing for the future carrying-out of the complete building with the minimum changes in grounds development. The exact location of building or buildings, together with height of foundation walls, placing of excavation, including stripping and piling of topsoil, and other features, should be determined on the landscape plans before the architect completes his plans, and in some cases such essential information is included on the architect's plans, together with location of walks and drives, and made a part of the general contract.

It would be possible to go on indefinitely in discussing the details which must be taken up in this way. For instance, where the building is located in a wooded area, the exact location of the drive should be determined so that all trucking can be done on the ultimate drive location, in order to save lawn areas and trees from injury. In the building of the educational plant, the cooperation of the architect and landscape architect in getting the work done is quite essential in accomplishing the best results.

Today is the day of specialists, and the landscape architect plays an important part in school grounds development. In the completed development there is a picture which is practical as well as esthetic, if properly planned. Schools with attractive surroundings exert considerable effect on growing children and should result, as is often the case, in making better citizens and in creating a feeling of civic pride in the children for the city in which they live.

Factors Needing Consideration in the Landscaping of School Grounds

BY CHARLES DOWNING LAY

LANDSCAPE ARCHITECT, NEW YORK

PLANNING and planting the grounds of a school is too often put off until the last minute, but it should be one of the first things considered. A sufficient amount of money to develop and plant the grounds should be provided when the funds for the building itself are raised. It is usually easier to get money for the grounds with the money for the building than it is to get it later, and a knowledge that funds are available makes the planning of the grounds at the proper time more certain.

As soon as the site is selected and, if possible, before it is bought, expert advice should be sought as to the suitability of the site for the building proposed. This is a question of more than architectural suitability, and comprehends all the practical questions which grow out of the use of the building. The success of the whole undertaking depends in large measure upon the proper relation of the building to its site and the manner in which it is planned.

The site must be large enough to insure proper light for all time. It must in some cases be large enough to allow extension of the building, and it must also be large enough for all the play space and athletic fields which are likely to be required. And the requirements in this direction are constantly increasing.

Giving Thought to Traffic and Parking

There are further considerations of size equally important today. Is the site large enough to give parking space for all the teachers' cars, and will the entrance drives be ample for all the busses and all the cars bringing and taking away pupils? If there is an assembly hall used for public exercises, can the traffic to and from that be handled easily?

If the athletic field is to be used for important games, it may be necessary to provide additional parking space for that. These are conditions which if not adequately met diminish the usefulness of the plant as a whole.

Problems of Topography

There are other things which should be considered before the site is bought or the general plan determined. They are questions of the cost of the work as it may be determined by the topography or by the conditions of the soil. It will make a considerable difference in the cost if the earth or rock from the cellar or foundations, or the material in excess because of necessary leveling, has to be hauled away instead of being used to fill on the grounds. If there are places which must be filled to be useful, where is the fill to be

Mabel Keyes Babcock, Landscape Architect

SETTING FOR FOUNTAIN IN GARDEN OF PRESIDENT'S HOUSE, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

EXEDRA IN PRESIDENT'S GARDEN, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

found? A good soil existing on the plot will obviously save much when it comes time to do seeding and planting.

Steep grades which will require many steps on entrance walks, or which will make the building of roads and parking spaces expensive, are, of course, not so desirable as easier slopes or as a level site.

Roads and Water-Supply

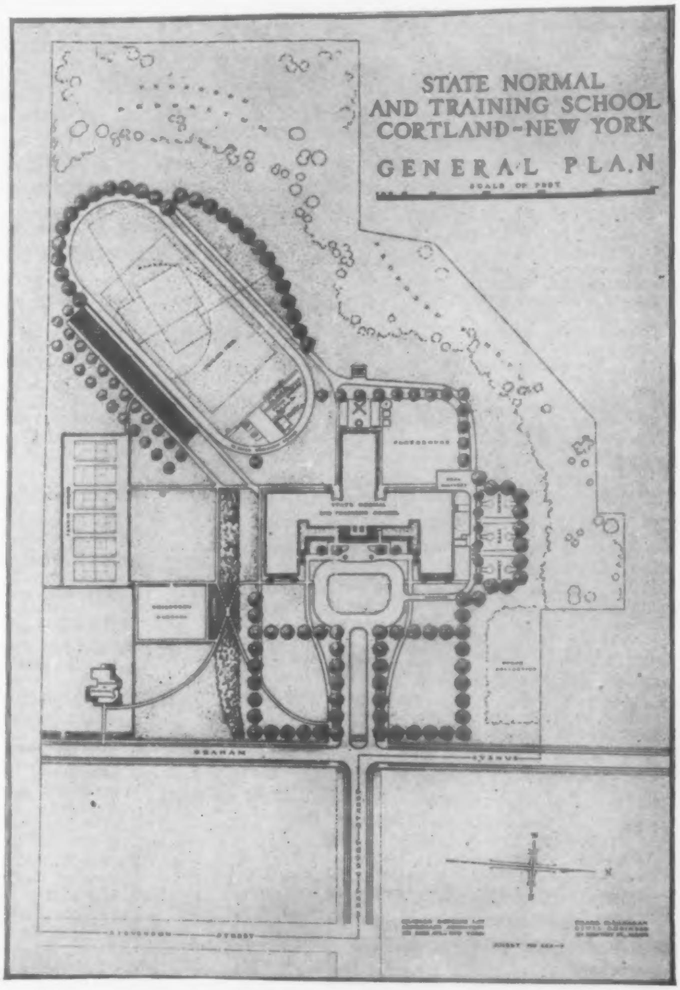
The durability of the construction goes far toward reducing the cost of maintenance. First-class concrete roads and walks, stone curbs and steps, will last without great cost for repairs for as long as they are needed. An ample water-supply, a more than adequate draining system, and a well-prepared soil, are also insurance against future trouble.

The arrangement of the grounds must be left to the expert in charge, but if he is consulted early he can often secure changes in the location or in the planning of the building, which save money or make the resulting work more perfectly adapted to its use.

Reducing Maintenance Costs to a Minimum

The planting of grounds should be given much thought, for a reduction of maintenance costs to a minimum is desirable. This can be secured by simplicity in the design, and usually by the use of native plant material or of plants or trees which have been proved successful in the locality. There should be a certain local pride in using the native trees and shrubs, but the first consideration is to use those which grow thriftily with little care, and have, if possible, some beauty or nobility of character.

It is not possible to give more explicit directions for planning or planting. Each school is a separate problem and must be studied by itself in order to attain the convenience of arrangement, the beauty of planting and the ease of maintenance which is the end desired by all; but it is certain that these qualities once attained have a great effect on the morale of pupils, of teachers and of citizens. The taxpayer may groan at the bills, but he knows in his heart that the luxury and comfort and elegance of modern school buildings must be matched by a like degree of finish in the grounds. Fine grounds are as necessary for a fine building as a healthy body for a healthy mind.



Landscape Architects for University and School Projects

The following directory is restricted to fellows or members of the American Society of Landscape Architects who are in independent professional practice and have actually been identified with a number of university or school projects.

Space limitations permit only three listings for each individual or firm, and preclude mentioning either the name of the architect associated or the definite character of the work undertaken for each institution. It is believed that the majority of landscape architects specializing in school and university work are here represented, and that many of the projects listed have had a considerable influence on high-grade professional practice in the planning and planting of school grounds and college campuses throughout the United States.

CALIFORNIA

Stephen Child, San Francisco
Lowthorpe School of Landscape Architecture for Women, Groton, Mass.
Convalescent Home, Children's Hospital, Wellesley, Mass.
State Normal School, Teachers College, San Jose

Cook, Hall & Cornell, Los Angeles
Pomona College, Claremont
Claremont College, Claremont
University of Hawaii, Honolulu

Frederick N. Evans, Sacramento
Sacramento Junior College Campus, Sacramento
Sacramento Public Schools Grounds, Sacramento
Woods Grammar School, Woodbridge

Howard Gilkey, Oakland
San Mateo Union High School, San Mateo
St. Mary's College, Moraga
Mills College, Oakland

John William Gregg, Berkeley and Los Angeles
High School Campus, Los Angeles
California State School for Boys, Whittier
University of California, Berkeley

McKown and Kuehl, Beverly Hills
Iowa State Teachers' College, Cedar Falls, Iowa
Public Schools, Davenport, Iowa
Huntington Beach Union High School, Huntington Beach

Emanuel Tillman Mische, Los Angeles
Warren G. Harding High School, Sawtelle
El Segundo High School, El Segundo
Beverly Hills High School, Beverly Hills

Paul G. Thiene, Los Angeles
Alhambra High School, Alhambra
Santa Maria Union High School, Santa Maria
Excelsior Union High School, Norwalk

COLORADO

S. R. DeBoer, Denver
University of Denver, Denver
Colorado Woman's College, Denver
The Idaho Technical Institute, Pocatello, Idaho

McCrary, Culley & Carhart, Denver
University of Colorado, Boulder
University of Wyoming, Laramie, Wyo.
Iowa State College, Ames, Iowa

ILLINOIS

Jacob L. Crane, Jr., Chicago
Lawrence College Campus, Appleton, Wis.
High School Campus, Ponca City, Okla.
Chicago Board of Education (64 schools)

Chance S. Hill, Chicago
North Central College Campus, Naperville
Downers Grove Community High School, Downers Grove
Wheaton Community High School, Wheaton

F. A. Cushing Smith & Associates, Chicago
High School Group, Shorewood, Milwaukee, Wis.
St. Joseph's Seminary, Hinsdale
Glenwood Manual Training School, Glenwood

Simonds & West, Chicago
Iowa State College, Ames, Iowa
Illinois College, Jacksonville
Millikin University, Decatur

INDIANA

Lawrence V. Sheridan, Indianapolis
St. Mary of the Woods Academy, Terre Haute
Butler University, Indianapolis
Purdue University, Lafayette

IOWA

Philip H. Elwood, Jr., Ames
State University of Iowa, Iowa City
State School for the Deaf, Council Bluffs
Dorothy Love Presbyterian Home, Sidney

MASSACHUSETTS

Mabel Keyes Babcock, Boston
Wellesley College Campus, Wellesley
Massachusetts Institute of Technology, Cambridge
Bates College (planting plan), Lewiston, Maine

Robert Washburn Beal, Boston
Brockton High School, Brockton
Bowdoin College, Bowdoin Athletic Field, Brunswick, Maine
High School Campus and Athletic Field, Whitman

Harold Hill Blossom, Boston
Beaver Country Day School, Brookline
Amherst College, Amherst
Dedham High School, Dedham

Herbert J. Kellaway, Boston
Amherst College, Amherst
Andover Theological Seminary, Cambridge
Hartford Theological Seminary, Hartford, Conn.

Warren H. Manning Offices, Inc., Cambridge
University of Virginia, Charlottesville, Va.
Western Reserve University, Cleveland, Ohio
North Carolina State College, Raleigh, N. C.

Hallam L. Movius, Boston
Beaver Country Day School, Brookline
University of Buffalo, Buffalo, N. Y.
Dalton High School, Dalton

Sam P. Negus, Boston
Notre Dame Academy, Roxbury
St. Gabriel's Parish School, Washington, D. C.
Boston College, Chestnut Hill

John Nolen, Cambridge
Babson Institute, Wellesley
Queens College, Charlotte, N. C.
University of Wisconsin, Madison, Wis.

Olmsted Brothers, Brookline
Phillips Academy, Andover
Denison University, Granville, Ohio
Duke University, Durham, N. C.

Bremer Whidden Pond, Boston
University of New Hampshire, Durham, N. H.
Colgate University, Hamilton, N. Y.
Southern Methodist University, Dallas, Texas

William H. Punchard, Boston
Middlebury College, Middlebury, Vt.
Abbot Academy, Andover
Woburn High School Athletic Field, Woburn

Arthur A. Shurtleff, Boston
Mount Holyoke College, Holyoke
Radcliffe College, Cambridge
Groton School, Groton

Fletcher Steele, Boston
Arapahoe Indian Mission, Cheyenne, Wyo.
Williams College, Williamstown
Woodberry Forest School, Woodberry Forest, Va.

Stiles & Van Kleek, Boston
Williams College (golf course), Williamstown
Tufts College (golf course), Medford
Taft School (golf course), Watertown, Conn.

Loring Underwood and Laurence S. Caldwell, Boston
Vassar College, Poughkeepsie, N. Y.
Bates College, Lewiston, Maine
Belmont High School, Belmont

Walker-Walker & Kingsbury, Boston
Chicopee High School, Chicopee
Washington Irving School, Boston
The Thomas School, Rowayton, Conn.

Frank A. Waugh, Amherst
Massachusetts Agricultural College, Amherst
Kansas State Agricultural College, Manhattan, Kans.
New York State Agricultural College, Geneva, N. Y.

MICHIGAN

T. Glenn Phillips, Detroit
Michigan State College, East Lansing
Sacred Heart Seminary, Detroit
University of Detroit, Detroit

Pinner & Wilcox, Detroit
Detroit Industrial School, Detroit
Schenley High School, Pittsburgh
Grosse Pointe High School, Grosse Pointe

MINNESOTA

Morell & Nichols, Inc.
University of Minnesota, Minneapolis
Washington State College, Pullman, Wash.
Carleton College, Northfield, Minn.

Charles H. Ramsdell, Minneapolis
Sioux Falls Schools, Sioux Falls, S. Dak.
Rochester Schools, Rochester
Northwestern Lutheran Academy, Mobridge, S. Dak.

MISSOURI

Hare & Hare, Kansas City
University of Kansas, Lawrence, Kans.
High School Campus, Longview, Wash.
8 Senior and Junior High Schools, Houston, Texas

John Noyes, St. Louis
St. Louis Country Day School, St. Louis
John Burroughs School, Clayton
Washington University, St. Louis

NEW JERSEY

Marjorie Sewell Cautley, Ridgewood
Fieldston School Campus, New York
Westport Grammar School Grounds, Westport, Conn.
Tenafly High School Grounds, Tenafly

NEW YORK

A. F. Brinckerhoff, New York
Middlebury College, Middlebury, Vt.
Bronxville Schools, Bronxville
Tuckahoe High School, Tuckahoe

Laurie D. Cox, Syracuse
Acadia University, Wolfville, Nova Scotia
New York State College of Forestry, Syracuse
Mamaroneck High School, Mamaroneck

Mrs. Beatrix Farrand, New York
Yale University, New Haven, Conn.
Princeton University, Princeton, N. J.
The Hill School, Pottstown, Pa.

Brinley & Holbrook, New York
Columbia High School, Maplewood, N. J.
Grammar Schools, Maplewood, N. J.
High School Campus, Asbury Park, N. J.

Bryant Fleming, Ithaca
Cornell University, Ithaca
Dennison University, Granville, Ohio
Toronto University, Toronto, Canada

Francis Hastings Gott, Rochester
Nazareth Convent and Academy, Pittsford
Batavia (athletic field), Batavia
Allendale School, Brighton

Roeder J. Kinkel, Buffalo
Evangelical Training School, Dunkirk
Batavia High School, Batavia
Masten Park High School, Buffalo

Charles Downing Lay, New York
New York State Normal Training School, Cortland
Newburgh Free Academy, Newburgh
Waterbury High School, Waterbury, Conn.

Charles N. Lowrie, New York
Yale University, New Haven, Conn.
Lawrenceville School, Lawrenceville, N. J
State School for the Deaf, Trenton, N. J.

Carl F. Pilat, New York
Cartaret Academy, Orange, N. J.
Ossining School, Ossining
Junior and Senior High School, Englewood, N. J.

Richard Schermerhorn, Jr., New York
Rensselaer Polytechnic Institute, Troy
Union College, Schenectady
St. Anthony's Seraphic Seminary, Catskill

Roland Schultheis, Flushing
De Witt Clinton High School, Bronx
High School, Far Rockaway
Grammar School, Forest Hills, L. I.

Ferruccio Vitale, New York
University of Illinois, Urbana, Ill.
Pleasantville High School, Pleasantville
Virginia Military Institute, Lexington, Va.

NORTH CAROLINA

E. S. Draper, Charlotte
Winthrop College, State College for Women, Rock Hill, S. C.
Furman University, Greenville, S. C.
Davidson College, Davidson

OHIO

A. D. Taylor, Cleveland
Carnegie Institute of Technology, Pittsburgh, Pa.
Oregon Agricultural College, Corvallis, Ore.
Mount Vernon College, Alliance

B. Ashburton Tripp, Cleveland
High School, Parkersburg, W. Va.
High School, Shaker Heights
High School, Cleveland Heights

PENNSYLVANIA

Harry B. Hostetter, Lancaster
Reformed Theological Seminary, Lancaster
Linden Hall Seminary for Girls, Lititz
Lower Paxton Vocational School, near Harrisburg

Thomas W. Sears, Philadelphia
Johns Hopkins University, Baltimore, Md.
North Carolina College for Women, Greensboro, N. C.
Pennsylvania State College, State College, Pa.

Wheelwright & Stevenson, Philadelphia
Scarsdale High School, Scarsdale, N. Y.
The Gunnery School, Washington, Conn.
Berkshire School, Sheffield, Mass.

WISCONSIN

Phelps Wyman, Milwaukee
State School of Mines, Rapid City, S. Dak.
University of North Dakota, Grand Forks, N. Dak.
Normal School, La Crosse

CANADA

Arthur M. Kruse, Toronto
The Boys' Training School, Bowmanville, Ontario
Woodstock College, Woodstock, Ontario
Belleville Institution for the Deaf, Belleville, Ontario

For a directory of Architects for Educational Buildings, see pages 414-438.

AMERICAN FENCE CONSTRUCTION CO.

Guaranty Fifth Avenue Building, NEW YORK, N. Y.

SALES OFFICES IN PRINCIPAL EASTERN CITIES

"Afco" Iron Picket Fences—"Afco" Chain Link Wire Fences Playground Equipment—Baseball and Tennis Backstops

"AFCO" SCHOOL FENCES

This company offers a wide and complete choice of designs in standardized fences and gates both of iron picket and chain link wire types. In addition, it is prepared to execute special-design fences and ornamental iron work from architect's designs. Some of our work of this kind is pictured here.

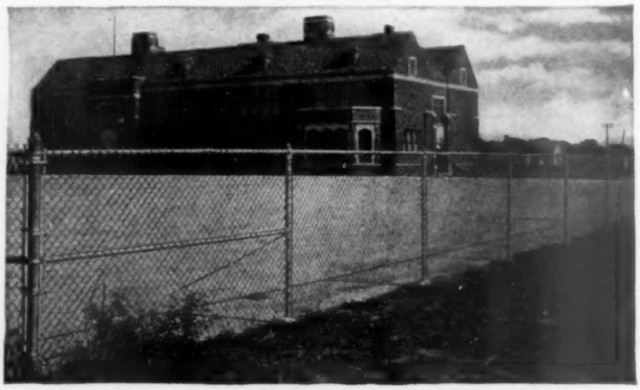
Afco Fences—whether copper-steel Chain Link or dignified Wrought Iron — is a quality product. Even so, there are other things to consider—erection for instance. In our compact, close-knit organization the construction men work with an appreciation of Company responsibility which shows in the fences they build.

IRON PICKET FENCES

Iron Picket fences, because of the infinite possibilities of ornamental design work, are standardized only in respect to the general use of certain "plain" picket fences. Ornamental work, special gates, etc., are executed in infinite variety.

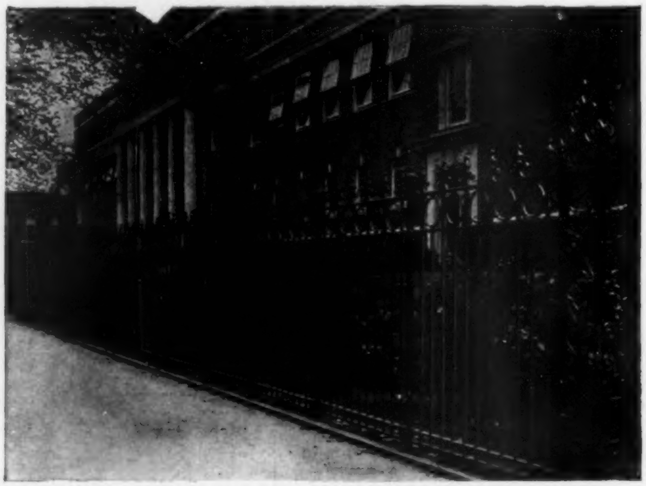
CHAIN LINK WIRE FENCES

Chain link wire fences, however, are a standardized product, in heights from 4 to 10 ft., as per specification details presented on the following page. All are built with Afco Chain Link Fabric of rust-resisting copper-bearing steel wire, galvanized after weaving by a special hot dip process.



"AFCO" GUARDIAN FENCE, 5 FEET HIGH
(See Specification)

Catalogues, installation views, and blue prints of stock and semi-standard designs of iron or wire fence are available for reference.



AN ORNAMENTAL "AFCO" IRON FENCE
Designed by Howard Chamberlain, Architect for Yonkers High School

ATHLETIC FIELDS

Playground and athletic fields, if detached, often require the more positive protection of a barb-wire topped non-climbable fence—for which a specification is given on the next page.

The Company also builds tennis fences, baseball backstops, handball court enclosures of standardized design, the detail specifications of which will be furnished on request.

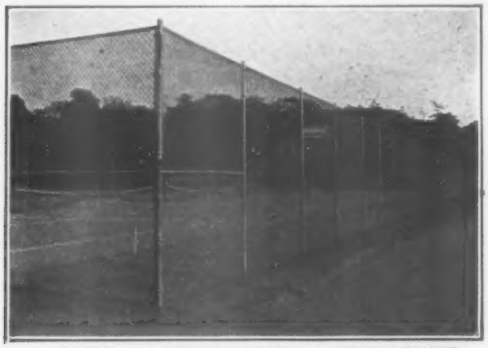
SPECIFICATIONS

AFCO GUARDIAN FENCE (FOR SCHOOL YARDS) [See illustration on facing page]

Heights shall be 4, 5 or 6 ft.

Posts—End, corner and gate posts (for gates up to 12-ft. openings) shall be 2½-in. outside diameter standard wrought pipe (3.65 lb. per ft.). Line posts shall be 2-in. outside diameter pipe (2.65 lb. per ft.).

Top Rail—Entire length of the line of fence, with the exception of the gate openings, shall have a reinforcing top rail of 1⅝-in. outside diameter standard wrought pipe, the lengths coupled together with outside sleeve couplings.



A TYPICAL AFCO TENNIS COURT FENCE

Wire Fabric—Shall be one single course of Afco Chain Link, made of standard gauge No. 9 (medium weight) wire, woven in a 2-in. mesh. Top and bottom selvage barbed. Hot dip galvanized after weaving, to give a coating of not less than 1.2 oz. per sq. ft. of actual wire surface. Fastened to the line posts with staples, to the top rail with No. 12 binding wire, to the terminal posts with straps and bands.

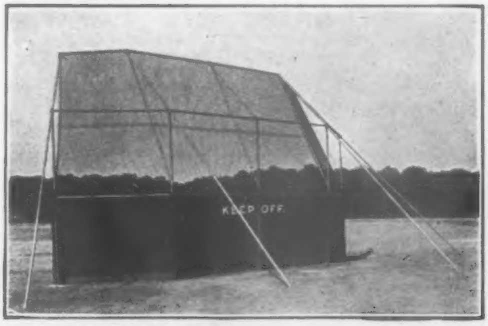
Bottom Reinforcing—Shall consist of one course of No. 7 galvanized coiled spring wire, running horizontally along the bottom of the fence, fastened to the fabric at intervals of not less than 2 ft.

Gates—Shall have frames of 1⅝-in. outside diameter tubular steel, horizontally braced through the center; welded at all joints; equipped with close setting malleable hinges (permitting full swing) and have positive locking device with attachment for padlock, center stop and keepers to secure gates when open. Gates shall be covered with fabric same as fence.

Framework Finish—All framework parts shall be galvanized by the hot dipping process after fabrication. Bolts used in assembling shall be hot dipped galvanized.

Post Footings—All posts shall be set in concrete bases, those for corner, end and gate posts 15-in. diameter and for the line posts 10-in. diameter, all 3 ft. deep. Mixture shall be 1:3:5 Portland cement, sand and crushed stone or gravel, cast rough in the ground, and domed above grade to shed water.

In General—All materials shall be the very best of their respective kinds, shipped knocked down so as to be easily assembled and erected. (On contracts not including erection, we shall furnish complete plans and setting instructions.)



AFCO BASEBALL BACKSTOP (Details on request)

AFCO BULWARK FENCE (FOR HEAVY DUTY)

This is a heavier weight fence, and is recommended wherever the service requires maximum ruggedness in a fence—and always for heights over 6 feet. The above "Guardian" specification applies with the following exceptions:

Heights shall be 5, 6, 7, 8, 9 or 10 ft.

Posts—Corner posts, end posts and gate posts for single gates to 6 ft., or double gates up to 12-ft. opening shall be 3-in. outside diameter standard wrought pipe (5.79 lb. per ft.); gate posts for larger gates up to 26 ft. double shall be 4-in. outside diameter (9.1 lb. per ft.) standard wrought pipe—all set to the full depth of footing. Line posts shall be 2½-in. outside diameter standard wrought pipe (3.65 lb. per ft.) with malleable iron post top fittings.

Gates—Made of 2-in. outside diameter tubular steel frames, braced and with all joints welded, with fittings same as gates for heavy fence.

AFCO "1103" NON-CLIMBABLE FENCE

This is a barb-wire topped fence for athletic fields, property lines, etc. The following alternate paragraphs should be employed in specifying:

Heights—7 or 8 ft. overall when erected.

Posts—End corner and gate posts as for "Bulwark" Fence. Line posts shall be Afco Integral Arm steel angles 2½ x 2-in. section, galvanized weight 3.8 lb. per lin. ft., spaced 10 ft. apart, fabricated to permit the top rail to pass through the 2½-in. leg; to create a 45° top overhang for carrying 3 courses of barb wire, and to provide for fastening the wire fabric with heavy staples.

Barb Wire—Fence shall have 3 courses of 4-points, thick-set galvanized barb wire, galvanized after weaving, fastened with staples to the post overhang, above the fabric.

IRON PICKET FENCE

3-in. I-beam line posts (5½ lb. section up to 6 ft. high—7½ lb. for greater heights) set in concrete without back bracing. Center-rib channel rails to afford extra metal where pickets are calked. Strong rigid panels 10-ft. long furnished with adjustable center support.

"TWIN THIRTY" WITH RIDING SULKY ON HIGH SCHOOL GROUNDS

"L" TWIN WITH GANG ATTACHMENT ON DORMITORY GROUNDS AT VASSAR COLLEGE

"TWIN THIRTY"

Rolls and **mows** simultaneously six to eight acres per day. Has full 30-inch, two-section drive roller with differential between rollers to prevent marking and make turning easy. 30-inch, 5-blade cutter.

Equipped with **two-cylinder,** four-cycle, water-cooled motor which provides an abundance of reserve power, is free from vibration and noise and will develop maximum power continuously in hottest weather without overheating.

Riding sulky for the operator, also grass catcher may be had as extra equipment.

Extremely useful where athletic fields are to be maintained.

"L" TWIN

Rolls and **mows** simultaneously four to six acres per day. Full 25-inch, two-section drive roller with differential. 25-inch, 5-blade cutter.

Two-cylinder, four-cycle, water-cooled motor supplies unusual reserve power.

This model may be had with the two 20-inch auxiliary gang units which increases the swath to 60 inches and more than doubles the capacity. Very useful for the wide open stretches of lawn.

In the "L" Twin is combined extreme flexibility for trimming and terrace work; a 25-inch combined mower and roller or separate roller and, with the gang attachment, a mower of exceptionally large capacity.

Riding sulky for the operator, also grass catcher may be had as extra equipment.

"L" JUNIOR

Rolls and **mows** simultaneously four to six acres per day. Full 25-inch, two-section drive roller with differential. 25-inch, 5-blade cutter.

A powerful, single-cylinder, four-cycle, water-cooled motor drives this light-weight mower and roller, furnishing plenty of power for use on grades and in tough grasses. Simple and sturdy in design and construction and moderate in price. Thoroughly dependable and extremely economical in operation.

Grass catcher may be had as extra equipment.

"CUB"

Rolls and **mows** simultaneously three to four acres per day.

Full 21-inch, two-section drive roller with differential. 21-inch, 5-blade cutter.

A light weight, simple, economical and dependable power mower and roller at a very moderate price. Especially well suited for lawns surrounding the smaller schools and also very useful for trimming and cutting the small plots on the larger campuses.

Equipped with a 4-cycle, water-cooled motor having unusual power for the size and weight of the machine. Unexcelled for hilly lawns.

STANDARD FEATURES IN ALL COLDWELL MODELS

Full-width drive rollers
Four-cycle, water-cooled motors
All machines complete, including the motor, designed and built in the Coldwell factory
Timken tapered roller bearings throughout
Alemite-Zerk force feed lubrication
Oil tempered, self-sharpening blades
Automatic spring loaded clutches require no adjustment
Combined rolling and mowing, or separate rolling when desired
Thoroughly dependable, trouble-free, economical operation over a period of years
A large selection of styles and sizes and at prices assuring the greatest possible value

A Complete Dependable Line of Hand, Horse and Power Lawn Mowers

SINCE 1867
COLDWELL
DEPENDABLE LAWN MOWERS

Hand—Horse—Gasoline—Electric

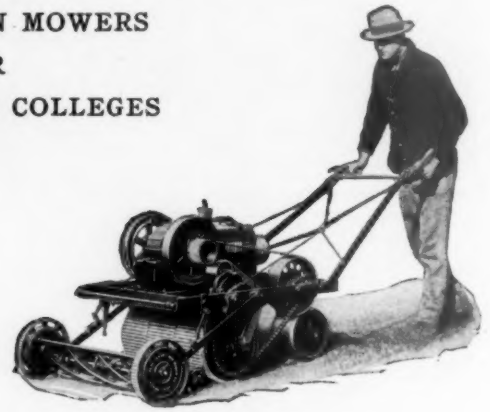
IDEAL POWER LAWN MOWER COMPANY

Main Office and Factory: LANSING, MICHIGAN

FACTORY BRANCHES

237 Lafayette St., New York — 413 W. Chicago Ave., Chicago
273 Boylston St., Brookline, Mass. — 161 Vester St., Ferndale (Detroit), Mich.

POWER LAWN MOWERS FOR SCHOOLS AND COLLEGES



IDEAL TWENTY-TWO

Combination power mower and roller. Width of cut 22 inches. Capacity, 3 to 4 acres per day. Magneto ignition. Five blade reel. Weight, 430 lbs. Recommended for the average small city, village or consolidated school grounds.

IDEAL THIRTY

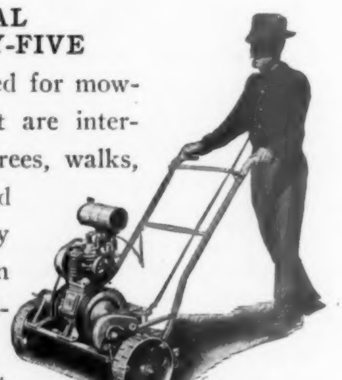
Roller type. Width of cut 30 inches. Capacity, 5 to 7 acres per day. Magneto ignition. Five blade reel. Weight, 630 lbs. For large grass areas around schools and colleges. Rolling feature very valuable for athletic fields, ball grounds, tennis courts, etc.

IDEAL TWENTY

Designed for mowing lawns that are too large to care for conveniently with hand mowers. Also for use on lawn with steep grades. Width of cut 20 inches. Capacity, 1 to 3 acres per day. Flywheel magneto. Control clutch on mower handle. Speed, 1 to 4 miles per hour. Five blade reel. Very simple adjustment. Weight, 245 lbs.

IDEAL TWENTY-FIVE

Recommended for mowing lawns that are interspersed with trees, walks, shrubs and where necessary to mow on grades and hillsides.



Width of cut 25 inches. Capacity, 4 to 6 acres per day. Flywheel magneto. Two clutches on mower handles, one for the drive wheels and one for cutting reel. Weight, 310 lbs.

A BIG CAPACITY MOWER FOR LARGE GRASS AREAS

The Ideal Triplex Lawn Mower is the speediest, most economical and most practical big capacity mower in the world.

It is particularly well adapted to the care of average college campus, athletic field, school ground of large acreage, or any large lawn that is landscaped with trees, shrubbery, walks, drives, etc.

Among the prominent educational institutions using the Ideal Triplex are Princeton University, Princeton Athletic Association (two machines), Yeadon School, Haverford College, Connecticut Agricultural College, Massachusetts Agricultural College, Smith College, Connecticut College for Women, Purdue University (two machines), University of Michigan, Evanston Township High School, Ohio State University.

The Triplex has a capacity of from 25 to 30 acres per day. It has the simplest and most responsive control of any big capacity mower built.

Two hand levers and foot throttle control its operation. It can be instantly started, stopped, backed up; and will turn around in its own length and can be manipulated in and out of close quarters and will turn around all obstructions just as quickly and easily as the smallest power mower.

Powered with a four-cylinder, water-cooled, gasoline engine, and equipped with the low-wheeled, close-coupled Bulldog cutting units. Speed from two to seven miles per hour. Total cutting width eighty-four inches.

SPECIAL EQUIPMENT

When used on a lawn with steep grades or hills the mower can be provided with extra wide traction wheels.

Rubber-tired equipment can be furnished when the mower is to be used on lawns located in various sections that require transporting on pavements or roads.

If you have a difficult mowing problem to contend with, where trees, flower beds, shrubbery, walks, etc., slow up your work, write for our special catalog on the Triplex Lawn Mower.

PENNSYLVANIA LAWN MOWER WORKS

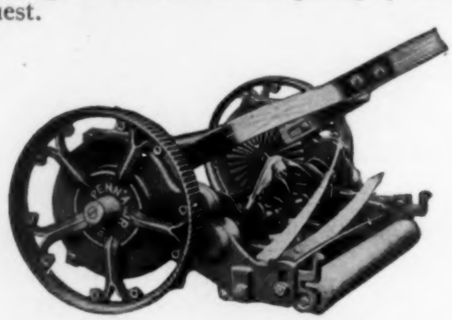
Manufacturers of

ALL TYPES OF MOWERS—HAND TYPE, HORSE-DRAWN AND TRACTOR-PULLED—FOR USE IN PUBLIC PARKS AND CEMETERIES AND ON GOLF COURSES, LARGE ESTATES AND SMALL LAWNS

1615–35 North 23rd Street

PHILADELPHIA

More than a half century of experience and the highest quality standards are behind every PENNSYLVANIA Quality Mower—whatever its type or price. Complete details of the PENNSYLVANIA Quality line are contained in our latest catalog which will be sent promptly on request.

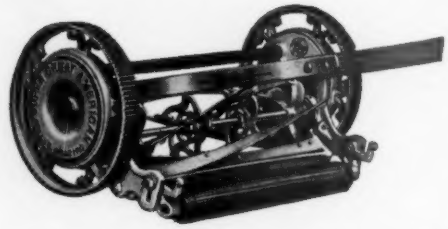


PENNSYLVANIA JUNIOR (Ball-Bearing)

There is no greater mower value on the market than that represented by this world-famous hand mower. Its self-sharpening feature alone makes it worth its cost to the user. Its cutting cylinders are now equipped with the revolutionary Braun Self-aligning Ball-Bearings, which make it still easier-running, smoother-cutting and longer-lasting.

PENNSYLVANIA SUPER ROLLER MOWER

This is the famous greens cutter which is used on leading golf courses in all parts of the world. It is a light-running, easy-pushing **precision** mower which was designed for the sole purpose of close-cropping golf putting greens.



SUPER GREAT AMERICAN, BALL-BEARING (Roller-Bearing Wheels)

This machine is the last word in quality lawn mower construction. The wheels are on the highest quality ball-bearings, with steel axles. The side plates are heavy and the set screws, both for the cylinder and the lower knife, are extra thick and will not work loose.

PENNSYLVANIA COMBINED TRIMMER AND EDGER (Ball-Bearing)

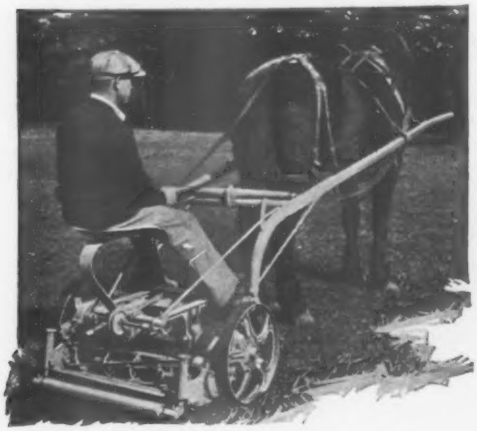
With this new labor-saving lawn accessory, you can trim overhanging grass along the edges of paths and flower beds and do other similar work that heretofore has required either a half-moon hoe, a grass hook or hand shears.

THE TRACTOR-PULLED PENNSYLVANIA "NEW" FAIRWAY MOWER

(Quint or Trio)

The "New" Fairway Mower has fewer parts, by actual count, than any other mower of its type on the market and is by far the quickest and easiest fairway mower to assemble and repair. The operator has constantly been kept in mind on every detail of construction. Any part on the frame or mower unit can quickly be detached for renewal and the adjustments are all of the simplest nature. Simpler construction and lighter weight mean lower operating cost and longer life, as well as fewer and easier adjustments and repairs.

Every moving part of the "New" Fairway is on roller or ball-bearings, except the ground rollers, which are on hardened steel bearings. The Mower Units are interchangeable. The tractor **pulls** the mower and is, therefore, easier to steer and to detach for other work. The lubrication throughout is Alemite.



PENNSYLVANIA FAIRWAY PONY MOWER

This machine is an outstanding improvement over conventional horse mowers of roller construction. Its lighter construction and larger wheels result in reduced draft; it has greater adjustability for height of cut; only the highest quality roller and ball-bearings are used, and it is equipped with an idling device similar to that used on the large trio and quint mowers.

PENNSYLVANIA LAWN CLEANER AND RAKE

By means of rapidly revolving rakes, this machine acts like a vacuum cleaner on the lawn, removing cut grass, leaves and other foreign matter that prevents sunlight and dew from reaching the roots. It is also made with brushes for lawn sweeping and for golf putting greens. With this Lawn Cleaner, one boy can do as much and better work than three men with hand rakes.

THE STEWART IRON WORKS COMPANY

INCORPORATED

Iron Fence, Chainlink Wire Fence and Ornamental Iron and Wirework

428 Stewart Block, CINCINNATI, OHIO

PRODUCTS

Arches for Gateways
Area Gratings
Balcony Railing
Basement Window Guards
Bracket Lanterns
Bridge Railing
Cashier's Cages
Cashier's Wickets
Cellar Doors
Chainlink Wire Fence
Coal Chute Doors
Counter Railings
Folding Gates
Fireproof Safes
Grilles
Gates for Stores, Banks and Offices
Iron Fence
Iron Reservoir Flower Vases
Jail and Prison Work
Lamp Standards
Lawn and Garden Fountains
Motor Truck Bodies
Porch Railing
Public Drinking Fountains
Settees and Chairs (Iron and Wire)
Stair Railing
Steel Shutters and Doors
Sidewalk Gratings
Vault Doors
Window Guards (Iron and Wire)
Wire Counter Railing
Wire Partition Railing
Wire Fence (Chainlink)

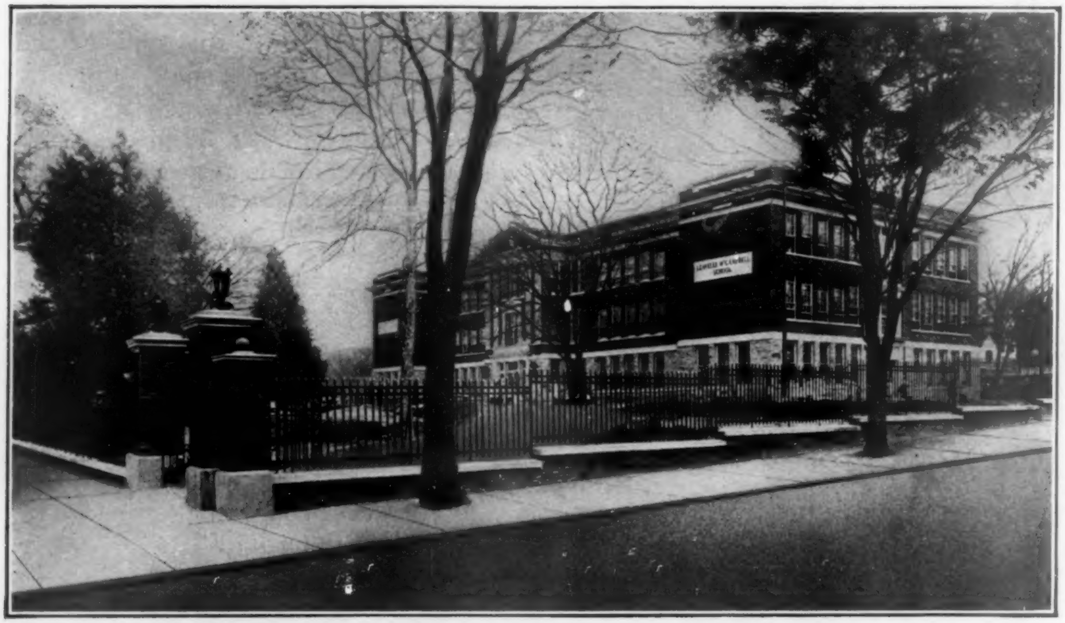
FACILITIES

This company, "The World's Greatest Iron Fence Builders," has unsurpassed facilities for the manufacture of any of the products listed above. These facilities comprise a factory containing 350,000 sq. ft. of floor space and covering 8 acres; an equipment of modern machinery; skilled workmen and a complete organization of engineers and draftsmen. This, together with over 40 years of practical experience in this line, insures the highest standard of work, prompt service and reasonable prices.

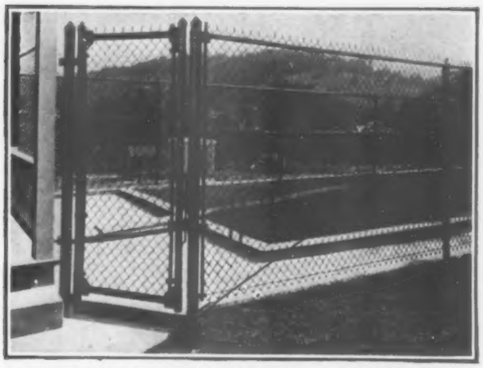
IRON FENCES AND GATES

This company specializes in the building of high grade plain and ornamental wrought iron fences and gates, light or heavy, for schools, playgrounds, parks, etc. They are constructed either from designs of its own draftsmen or from drawings and specifications submitted by customers. From its experience, the company is qualified to advise as to the type of fence best adapted to particular conditions and to aid in the most satisfactory and economical solution of fencing problems.

For the front approach and lawns of the well-planned school premises nothing can take the place of a high-grade, well-designed Wrought Iron Fence. Such a fence can be erected to any reasonable height, and will be as nearly non-climbable as a fence can be made. A wide variety of tasteful designs are available which create that atmosphere of dignity and permanence which should always be inseparable from any public institution.



THERE IS SUBSTANTIAL BEAUTY IN STEWART WROUGHT IRON FENCE AND GATES FOR SCHOOL FRONTAGES



STEWART CHAINLINK FENCE EXCLUDES INTRUDERS FROM THIS SCHOOL SWIMMING POOL

CHAINLINK WIRE FENCE

For the playground, Wrought Iron Fence is also preferred if the grounds have a street frontage. If not, or if available funds are limited, Stewart Chainlink Fence will serve the purpose admirably. It can be supplied in various heights to suit any and all purposes where protection and durability are the principal requirements, such as for athletic fields, swimming pools, tennis courts, baseball backstops, etc.

THIS PLAYGROUND IS AMPLY PROTECTED BY STEWART NON-CLIMBABLE CHAINLINK FENCE

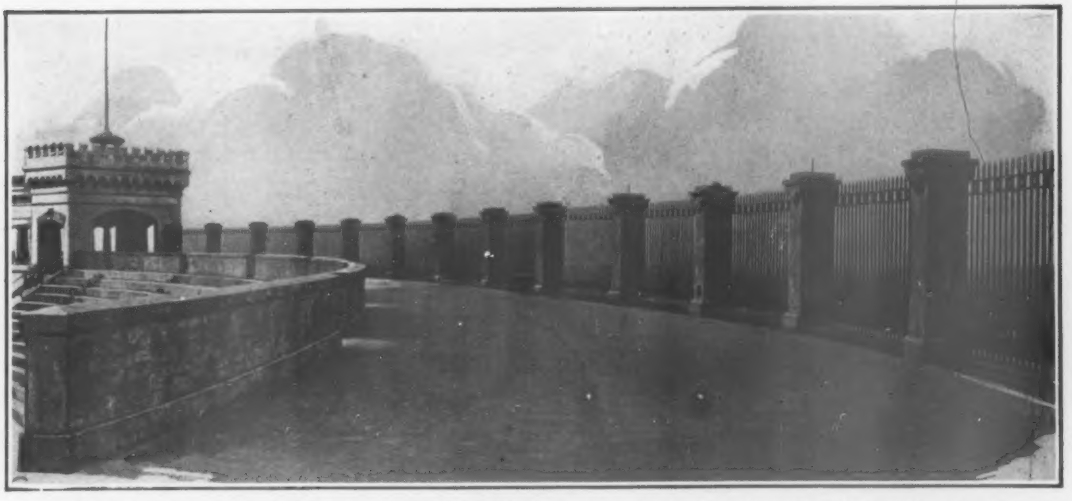
STEWART CHAINLINK FABRIC

Woven of No. 6, No. 9 or No. 11 gauge, copper-bearing steel wire, hot dip galvanized after weaving. This fabric has a galvanized coating which actually weighs between eight and nine per cent of the finished product, and the coating is approximately five times heavier than that of the regular grade of galvanized wire.

STEWART CONSTRUCTION AT CORNERS AND GATES MAKES AN EXCEPTIONALLY SUBSTANTIAL STRUCTURE

This company is prepared to study your requirements and will be glad to submit special designs or ideas in connection with any proposition that may be under consideration.

Complete catalogs of Stewart Wrought Iron Fence and Chainlink Fence are available and on request the special School and Playground Fence Bulletin will be sent.



STEWART WROUGHT IRON FENCE GIVES DIGNITY AND BEAUTY, AS WELL AS PROTECTION, TO THIS ATHLETIC STADIUM

BOBBINK & ATKINS

Nurserymen **and Florists**

RUTHERFORD, NEW JERSEY

ROSES FOR SPRING PLANTING

We have several hundred thousand two-year-old, low-budded, field-grown Rose plants in several hundred varieties ready to ship this Spring.

"Roses by Bobbink & Atkins," our revised Rose Catalog is profusely illustrated in color. Many new and rare varieties have been included; an extensive list of Climbing and Roses adapted to all parts of the country are described and priced. Descriptions are given with comments on their merits and demerits. All are classified and arranged to help the buyer.

HARDY HERBACEOUS PLANTS

Our Catalog, Hardy Herbaceous Plants, contains a complete list of Old-fashioned Flowers and Rock Garden Plants, many of which we have growing in pots. Beautifully illustrated in color and black. It contains an alphabetical table of Hardy Herbaceous Plants, indicating Flowering period, approximate height and color.

EVERGREENS, TREES, SHRUBS AND VINES

An illustrated Catalog of Hardy Azeleas, Conifers, Evergreens, Hardy Broad-leaved Evergreens, Flowering Shrubs, Hedge Plants, Hardy Vines, Lilacs, Rhododendrons, Shade Trees.

OUR SPECIALTIES

Chinese Magnolias, Evergreen Azaleas, Lilacs, Japanese Maples, Koster and Moerheimi Blue Spruce, Rare Flowering Shrubs, Red Dogwood, Weeping Flowering Cherries.

VINES AND CLIMBERS

Ampelopsis, Aristolochia, Bignonias, Cotoneasters, Euonymus in variety, Honeysuckle, Ivies, Silver Lace Vine, Wisterias.

HEART CYPRESS TUBS

We take pleasure in directing the attention of our patrons to our Plant Tub Manufacturing Department. These are described in our special Tub pamphlet. Estimates furnished for special tubs.

CATALOGS

In your request for Catalog it is important to state definitely what you intend to plant. We issue several Catalogs.

THE FATE-ROOT-HEATH COMPANY

876 Bell St.

PLYMOUTH, OHIO

THE PEERLESS MOWER SHARPENER

The Peerless Mower Sharpener is a remarkable invention that sharpens all makes of power and hand lawnmowers and cutting units scientifically, quickly, perfectly, doing the work as nothing else can.

One of the big expense items of a well-kept athletic field, campus or golf course is the cost of sharpening mowers and cutting units. Whether you sharpen your own, or have it done outside, you can save money by adopting the modern method—the Peerless Mower Sharpener. It not only **saves money** by sharpening mowers in one-half the time, but does the work **so much better** that there is really no comparison.

If you are using files, it is slow and expensive, as most mowers are now made with hardened blades.

A FEW OF THE HUNDREDS OF USERS OF THE PEERLESS MOWER SHARPENER

Brentwood Country Club....Los Angeles, Calif.
Baltusral Golf Club ....Baltusral, N. J.
Columbus Country Club ....Columbus, Ohio
Cherryhill Club ....Denver, Colo.
Country Club, The ....Salt Lake City, Utah
Colo. State Teachers' College.....Greely, Colo.
Culver Military Academy..........Culver, Ind.
Great Lakes Naval School....Great Lakes, Ill.
Galveston Country Club ....Galveston, Tex.
Highland Country Club........Pittsburgh, Pa.
Inwood Country Club ....Inwood, N. J.
Inverness Club ....Toledo, Ohio
Kahkwa Club ....Erie, Pa.
Kalamazoo Country Club .....Kalamazoo, Mich.
Kenyon College ....Gambier, Ohio
Lansing Country Club..........Lansing, Mich.
Merion Cricket Club ....Philadelphia, Pa.
Nat'l Golf Links of America..Southampton, N. Y.
Naval Training Station.........Newport, R. I.
Northfield Seminary ....Northfield, Mass.
Northwestern University.........Evanston, Ill.
Olympia Fields Country Club ....Matteson, Ill.
Pinehurst Country Club ......Pinehurst, N. C.
Piping Rock Golf Club....Locust Valley, N. Y.
Port Arthur Industrial School..Port Arthur, Tex.
Ridgewood Golf Club ....Cleveland, Ohio
Rochester Municipal Corp......Rochester, N. Y.
Rutgers College..........New Brunswick, N. J.
Skokie Country Club ....Glencoe, Ill.
Somerset Country Club ....St. Paul, Minn.
Seattle Golf Club ....Seattle, Wash.
Stambaugh Township Schools..Stambaugh, Mich.
Swathmore College ....Swathmore, Pa.
Tome School (The)..........Port Deposit, Md.
Winter Park Golf Club ......Winter Park, Fla.
Westchester-Biltmore Club ....Rye, N. Y.
Youngstown Country Club...Youngstown, Ohio
Tedesco Country Club ......Swampscott, Mass.

If you use emery dust you reduce the clearance behind the cutting edge; the mower runs hard and **tears** the grass instead of shearing.

The Peerless Sharpener produces a perfect cutting edge, with the **proper clearance** or bevel. Mowers run easier, less power is required, hence more speed is obtained. Grass is **sheared** off—not chewed off or pulled out by the roots.

Simple to Operate—Equipped with a ⅓-H.P. motor—attach to your light socket. Place the mower in position, make a few simple adjustments, turn on the power, and in a few minutes you have a cutting unit with a razor-like edge. The Peerless Sharpener sharpens all makes of power, horse or hand mowers perfectly. It is equipped with special grinding wheel for grass shears, hedge shears, sickles, etc., and an attachment for sharpening all makes of skates, including hockey. It can be used the whole year 'round.

We have a handsomely illustrated catalog awaiting your request. Write today—now—and learn the full possibilities of this wonderful machine.

JACOBSEN MANUFACTURING COMPANY

RACINE, WISCONSIN

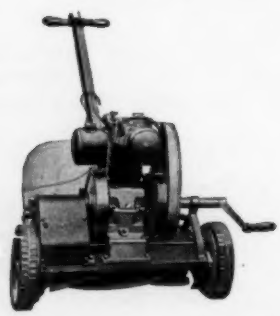
THE "4-ACRE" POWER LAWN MOWER

Beautiful lawns are an asset to schools and universities. Mowing these spacious lawns, campuses and playgrounds is greatly simplified by Jacobsen Power Mowers. The "4-Acre" Mower cuts a 24-inch swath at the rate of four acres a day—work that would require 4 or 5 men with push-type mowers. It produces a smooth, velvety lawn, negotiates terraces, and the automobile-type differential makes it steer easily about trees and other obstructions.

There are no chains, no sprockets on the Jacobsen Mower. It is driven by gears enclosed in double, oil-tight housings. The cutting reel and traction unit have independent clutch controls. The knives are sharpened by the mower's own power.

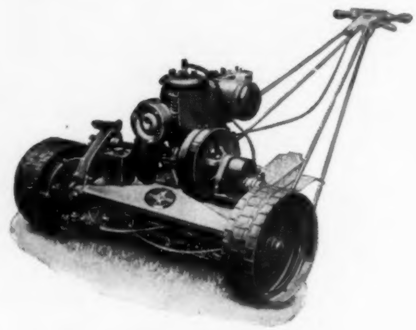
The 4-Acre Mower may be had with a Sickle-Bar Clipping Attachment and with a detachable riding cart if desired. The clipping attachment cuts tall, tough grass, dandelions, plantain, buckhorn and other destroyers of lawn beauty which are beyond the scope of the cutting reel.

THE "JUNIOR" 19-INCH POWER MOWER



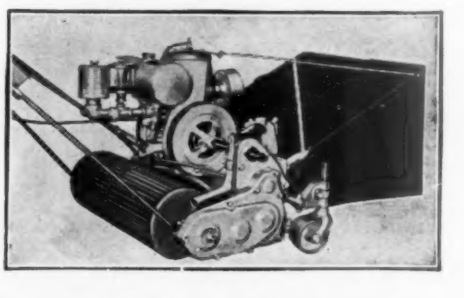
This quality power mower has less capacity than the "4-Acre" Model but is suitable for high-school lawns or any moderately large lawn. It does the work of two or three men with push-type mowers, steers easier than a hand mower and is equipped to sharpen the knives by the mower's own power.

All Jacobsen Mowers are the product of experience; known and used for years throughout the country and have won an enviable reputation for simplicity, sturdiness and dependable performance. Rigidly guaranteed. Demonstrations on your own grounds without obligation.



SOME OF THE UNIVERSITIES USING JACOBSEN MOWERS

University of Arizona
University of California
Yale University
University of Florida
University of Idaho
University of Chicago
Northwestern University
University of Illinois
University of Hawaii
University of Minneapolis
University of Nevada
University of New Hampshire
Fordham University
Cornell University
University of N. Dakota
University of Oregon
University of Tenn.
University of Utah
University of Wisconsin
University of Wyoming



THE "ESTATE" MOWER

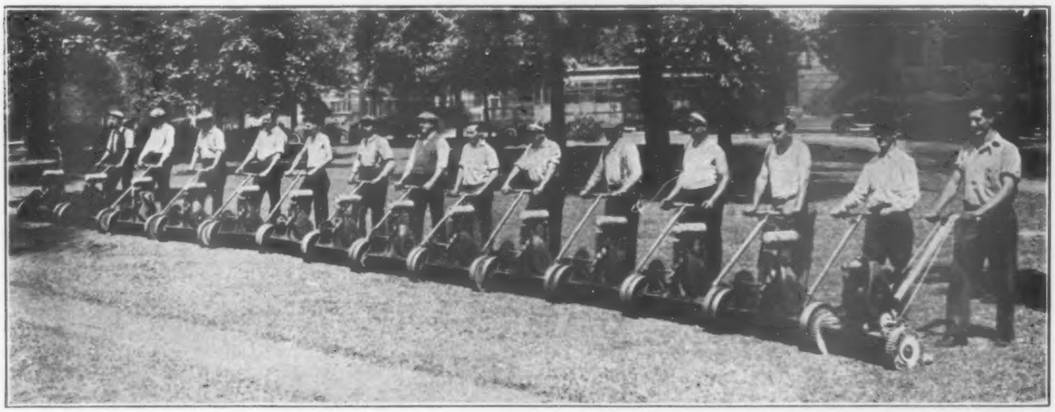
This light roller-driven mower represents the highest development in power mowers. It is designed after the famous Jacobsen Power Putting Green Mower, now used on the finest putting greens from coast to coast.

The special 6-blade reel cuts finer than any hand mower and does the work of 4 or 5 men with hand mowers. The rear-drive rollers give a beneficial rolling effect that makes a healthy, velvety turf.

Write for descriptive literature and prices.

THE MOTO-MOWER COMPANY

3246 E. Woodbridge St., Detroit, Michigan

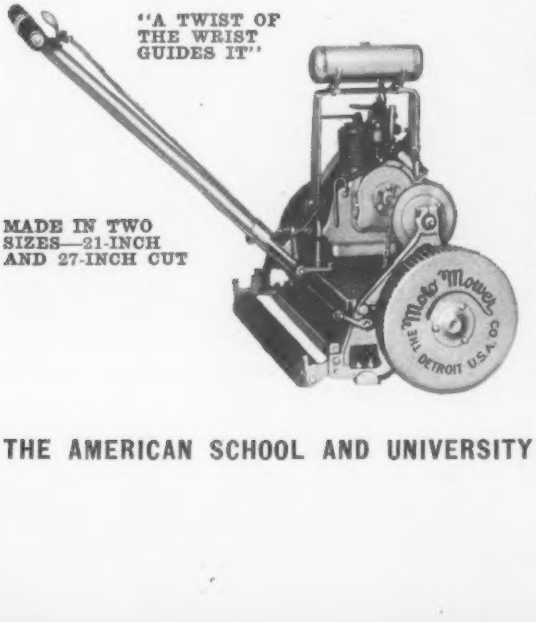


ONE BATTALION OF THE BATTERY OF FORTY MOTO-MOWERS USED BY THE DEPARTMENT OF PARKS AND BOULEVARDS, CITY OF DETROIT

MOTO-MOWER FOR GRASS CUTTING EFFICIENCY

The Moto-Mower is a simple, compactly designed, moderately priced power lawn mower; light enough to be easily run up and down and over your terraces; small enough to cut close to trees, hedges and flower beds, which eliminates trimming by hand; economical in gasoline and maintenance and so fool-proof that almost anyone can be trusted to run it without danger of its getting out of order. Furthermore, it is a machine that will do a big day's work of ordinary straightaway cutting on open lawns.

"A TWIST OF THE WRIST GUIDES IT"



MADE IN TWO SIZES—21-INCH AND 27-INCH CUT

The simplicity of operation of the Moto-Mower is a revelation. It starts, stops and turns in any direction under its own power by the mere rotation of two rubber grips on the handle; no physical effort is required.

In cutting around trees and shrubbery, it is often advantageous to operate the Moto-Mower at a somewhat slower speed than on the straightaway, and again in the cutting on hilly ground additional power is often required. The throttle control mounted on the handle allows the operator to vary the speed of the machine as conditions require. Regardless of how fast or how slowly the Moto-Mower travels over the ground it will cut the grass with equal efficiency.

LIGHT WEIGHT

Practically the entire mower unit is made of malleable iron and steel. Thus we have been able to keep lightness of weight, together with great strength and durability. Light weight means small gas consumption, and easy handling.

Further details may be obtained by writing for our illustrated booklet.

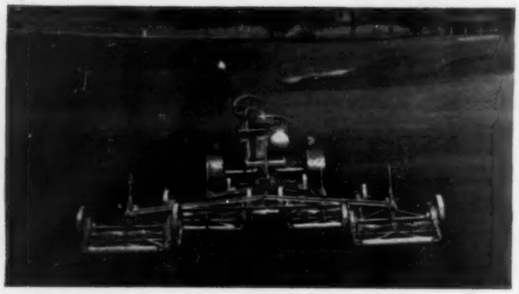
WORTHINGTON MOWER COMPANY

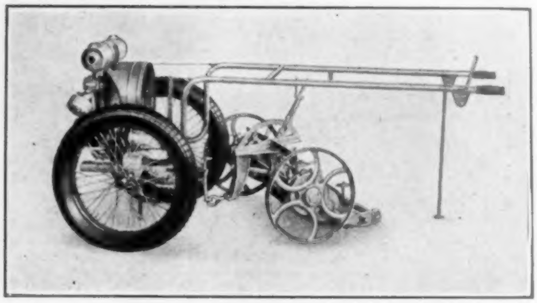
Manufacturers of Power, Gang, and Hand Mowers, Lawn Tractors and Golf Course Appurtenances

NEW YORK | STROUDSBURG, PA. | CLEVELAND
SAN FRANCISCO | MONTREAL | CHICAGO

AGENCIES IN ALL PRINCIPAL CITIES

THE STANDARD MOWING EQUIPMENT OF THE WORLD





LAWN TRACTOR AND CONVERTIBLE QUINTUPLEX COMBINATION

Illustrating the fastest and most economical lawn tractor and gang mower in the world. Cutting swath nearly 12 feet.

This outfit is capable of cutting an acre of ground in less than seven minutes. Speed and economy have become today, primal factors in the mower problem. With respect to both of these the Worthington combination stands unrivalled. If the widest swath cannot be accommodated the trailing frame of the "Quint" is immediately detached by removing a single bolt, reducing the swath cut to nearly eight feet. Tractor weight of only 1000 pounds eliminates all possibility of injury to turf.

WORTHINGTON "OVERLAWN" POWER MOWER

The "Overlawn" composed of a complete tractor drawing a standard 30-inch fairway unit.

Tractor motor is of standard construction. This machine has been especially designed for the mowing of restricted areas. Turns on a radius of two and one-half feet and is unequalled in freedom from derangement or delays. The "Overgreen" consists of the same tractor with three thirteen-inch seven blade high-speed reel units which will cut the average putting green in fifteen minutes. With three eighteen-inch high-speed reel units, it cuts a swath of fifty inches, for private estates, tennis turf and confined areas.

IT IS SIGNIFICANT THAT WORTHINGTON GANG MOWERS ARE USED ON MORE GOLF COURSES IN THE WORLD THAN ALL OTHER MAKES COMBINED.

Section V

BUILDINGS AND EQUIPMENT FOR PHYSICAL EDUCATION AND PLAY

Allen & Collens, Architects

ARCHITECTS' SKETCH OF THE PROPOSED SPORTS BUILDING, VASSAR COLLEGE

Factors Which Should Guide the Design of Buildings for Physical Education

BY HENRY NOBLE MACCRACKEN

PRESIDENT, VASSAR COLLEGE

THE inclusion of equipment for use in physical education is now a universal practice among American schools and colleges. Progress has been made in the past thirty years in the direction of standardization of this equipment, but until physical education is recognized on an academic basis, this branch of educational architecture is likely to remain where it is as a factor rather than as an indispensable element.

Those portions of equipment for physical education which attract the public are frequently palatial and indeed monumental. Millions of dollars have been expended on stadia and other outdoor equipment which appeal to large audiences from the nature of the contests. It remains true, however, that not until recent years has there been an attempt to establish a philosophy for this branch of study on the basis of which its future program will be developed. It is the attempt of this article to suggest such philosophy.

Is Physical Education a Science or an Art?

The curriculum of the American college and university divides rather simply into two chief groups: the sciences, or those studies which deal with the quantitative measurement of our universe; and the arts, or those studies which deal with the use of this universe for the pleasure of man. In which group does physical education fall? Historically, it is clear that physical education was to be included among the first group. At least this is true within recent times. In ancient Greece, physical prowess in Olympian or other games was a substitute for the practice of war by the aristocracy. The patriotic fervor attending the games, the stimulus to sculpture, poetry and other arts which the races and other contests afforded, went far to establish a cult of the body in Greece as a fine art. Modern physical education, however, does not date from Greece but from the rise of nationalism in Europe. It is a substitute for military education established by German leaders after the Napoleonic wars, when Germany, as in the present instance, was forbidden to have more than the pretense of an army. It was a means of increasing the quantitative strength of a nation and, as such, was extremely successful. It has ever since been closely associated with military training, and much of the support that has attended the movement in public education in this country has military purposes as its chief motive.

The new movement in physical education which arose during the first half of the nineteenth century naturally followed this impulse. Physical education began with a quantitative measurement of physical strength and had as its aim the increasing of that strength and ability in its use. The gymnasia in this country were filled with apparatus designed for the putting on of muscle.

The gymnastic groups of the Scandinavian and Teutonic nations glorified the athlete who could "put up a 56" as a god of their adoration. Strength tests were given in all the colleges and prizes awarded for the man who could grip the hardest, chin himself the largest number of times, and perform other feats of muscular magnitude.

The later history of these young athletes, however, gave rise to some concern. The number of illnesses, the amount of degeneration in the physical ability of this group, led students of the subject to question the wisdom of this ideal as an educational practice. It was found that it did not provide some of the chief rewards of study. Many students were incapable of raising their quantitative measurements in any appreciable degree, and the exercise rather injured than helped them. Attention was directed less upon the muscle and more upon the whole organism, including the heart, lungs and other internal organs. The result of all this pressure from medical science on the one hand, social disapproval on another, and esthetics on a third angle, was a reformation in physical education.

The Reformed Ideal of Physical Education

This reform has three main features: the adjustment of the whole organism to its environmental demands; the social rewards and pleasures of competitive exercise; and the esthetic rewards of the fine art of bodily control. The first two are well advanced; the third remains to be set up as a standard of achievement. The gymnasium and all the other plants for physical education in the future should take account of all three features and, in my opinion, most of all of the third, which will be the development of the future.

First, then, the gymnasium should take account of the successful adjustment of the individual body to its environment. This means the improvement of any defective organs or movements, correction of bad posture and faulty health habits. This in turn involves an expensive series of examination and conference rooms, since this branch of education must be individual in character. The provision of these rooms under attractive living conditions is essential to the future success of the Department of Physical Education. Too often the office of the director and the rooms for consultation and measurement are mere afterthoughts, or are designed merely as offices without thought of their use. Sometimes they are placed at the noisiest and most frequented entrance to a gymnasium, where they are least desired. Quiet, purity of air, sunshine and cheerfulness, in fact, every element that makes for successful and happy adjustment of the individual, should be sited in these rooms. Provision should be made for photography and posing of the human body for scientific examination. Everything that causes concern and suspicion should be removed, and everything that promotes confidence and cooperation should be installed. The gymnasia should, in this respect, pattern themselves upon the latest medical sciences and the best practice of hospitals. Small classrooms for group consultation and advice should be installed, and rooms for the practice of corrective gymnastics set up.

Secondly, the use of the gymnasium for the promotion of the social advantages of competitive exercise should be a determining factor. In other words, the modern gymnasium is conceived in part as a sports building. This means that as many games as possible shall be installed and that these games shall be designed for the simultaneous use of as many persons as possible. These games, further, should take place under the most desirable conditions of fresh air, with as much direct ventilation as the climate can provide, and as much direct sunshine as possible, without the intervention of glass, and isolation where the utmost unselfconsciousness and freedom on the part of the contestants can be promoted. Designs announced for some of the leading gymnasiums during the year carry out this idea. The study of over thirty gymnasia resulted in the drafting of the plans for the gymnasium at Vassar based on the idea of the country club. With plenty of land available, it was possible to put all sports on the same floor at no greater cost than a building several stories high. A building design suggesting an English manor and farm outbuildings brought the group into a harmonious architectural relationship. Every effort was made to convey the suggestion to the contestants that the conditions surrounding their competitive exercises were as nearly as possible those of the open air.

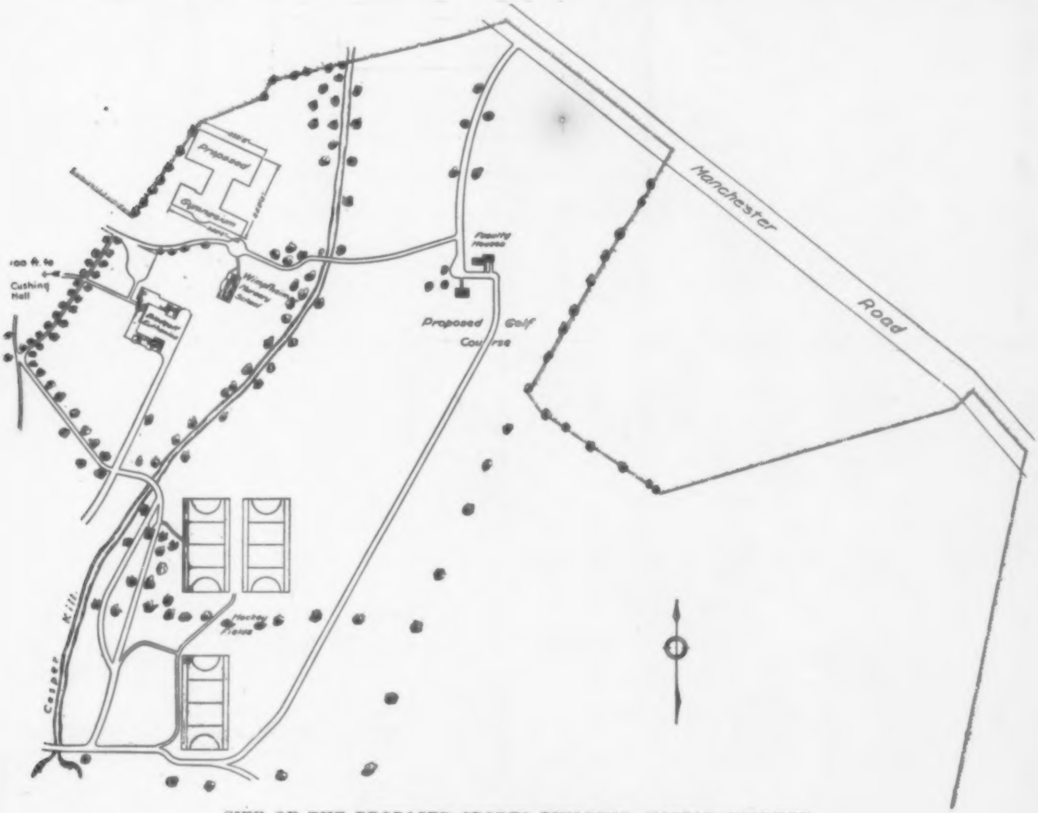
The Social Discipline of Competitive Games

The great argument for competitive games as an essential branch of physical education is its social discipline. Games are a happy combination of wit and will, strength and agility. Cooperation and organized attack upon problems are taught, together with the control of temper and the sublimation of suppressed desires into an outward manifestation. From the physical point of view, the training of the body is general rather than particular and should result in a harmonious development rather than a specialized one. Moreover, the pleasure resulting from games suggests the formation of habit that will continue long after the formal period of education and hence provides a life satisfaction. The mental concentration required of most physical games gives relief from intellectual concern and worry, and is the completest recreation, a factor essential in physical programs.

It is true, however, that Americans tend to carry their nervous concentration into their games and very often are taught to care more about winning than about playing the game. The difference is shown in the notion, widespread in this country, that games are for the specialized athlete rather than for the whole community. In England, where every family from lowest to highest throughout the land engages in physical games

every day, the opposite tendency is seen. In America, the tendency unfortunately is toward the organized public playground and the directed games. Perhaps after a generation or two have grown up under the stimulation of our gymnasia and playgrounds, we may be as fond of sports as the English. In the meantime, every effort should be made to get rid of the false stimulus of game winning and to develop among every group the love of competitive sports.

usually the ugliest. The inclusion of the swimming pool should be not ignored or concealed, but made an essential part of a harmonious design. The unwieldiness of its exercise rooms should be studied by architects and brought into harmony with the plan, both inside and out. Color, proportion and symmetry should be cited. At present, gymnasium interiors look like jails, swimming pools are buried in sub-basements, dressing-rooms dark and unsanitary. The dress-



SITE OF THE PROPOSED SPORTS BUILDING, VASSAR COLLEGE

The Gymnasium Should Eliminate Details That Lessen the Advantages of Exercise

The necessary incidents of sport are the preparation for sports in costume, and the bathing of large groups simultaneously. This involves group dressing and bathing, and the design of dressing-rooms and baths attractive and desirable in themselves. Odors from heating incident to bathing should be eliminated from other parts of the building. The country club design most easily provides for this. Elimination of expensive corridors and passages for athletes to reach their sports should also be cited. In short, every effort should be made to increase the advantages of exercise and eliminate the main incidents.

Surely the gymnasium should be the most beautiful building on the campus. At present, it is ing facilities of some of the finest New York clubs are incredibly stuffy and smelly. Gymnasium interiors are frequently not even up to the Victorian stage of armory architecture.

Physical Education a Fine Art, to Be Housed in a Beautiful Building

In short, the conception of physical education as a fine art to be housed in a beautiful building with every incentive for the love of beauty and pride in the body has hardly dawned upon American architecture or builders of gymnasia. This to my mind is fundamental and should guide design everywhere. It need not make the building more expensive. True beauty is also highest economy. Provision should be made for the aspects of physical education that contribute directly to the fine arts: esthetic dancing, including both the common folk-dancing and the highest

skills, should be cultivated both by men and women. Provision should be made for music in the original design, and also for fine art in the mural decoration and sculpture.

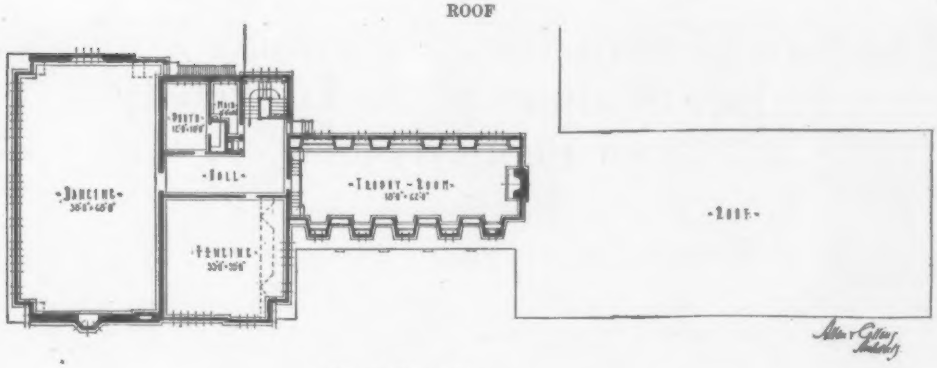
It is my firm belief that if the esthetic elements of physical education are cultivated, most of the ignoble elements of this branch of American life will be placed on the college campus midway between the halls of music and of art.

It goes without saying that the gymnasium and all physical equipment of an architectural character would profit by all engineering and medical science, though in this, as in every branch of education, architecture should be the outward im-

BASEMENT PLAN

SPORTS BUILDING VASSAR COLLEGE

may be avoided. A beautiful action is often to be more desired by young people than a good action, for as an eighteenth century writer put it, "To do well is better than to do good." I must not be misunderstood in this matter. I am not advocating the cultivation of esthetic poses as a conscious parade, but of the higher satisfactions in the creative aspects of physical culture. I believe the time will come when the gymnasium pression of an educational philosophy, and this philosophy must in the long run determine the character of the building. If builders and architects will seek counsel among the educational leaders, their buildings will be more lasting in utility and there will be fewer halls, laboratories and gymnasia on our campuses utterly antiquated and out of date within a couple of decades, such as deface our academic groves today.



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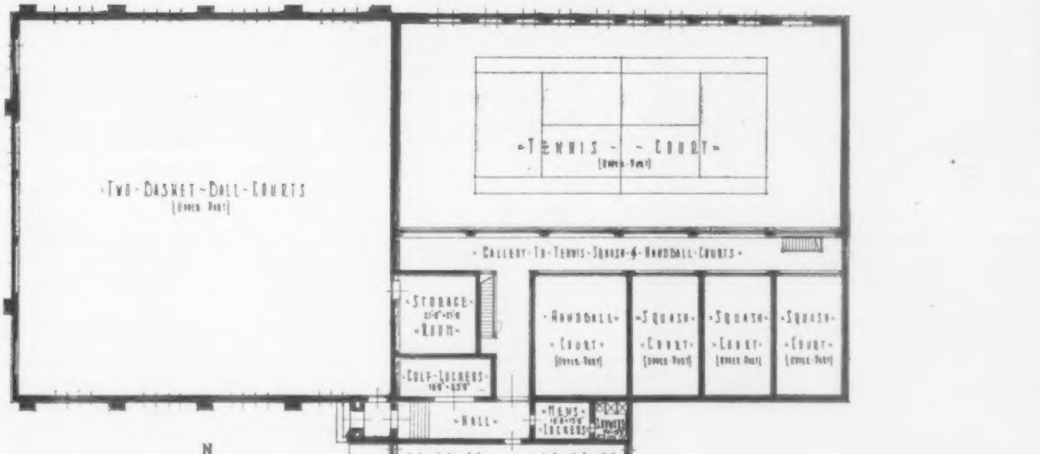


- FIRST - FLOOR - PLAN -

- SPORTS - BUILDING - VASSAR - COLLEGE -

The New Gymnasium, Swimming Pool and Indoor Stadium of the University of Pennsylvania

BY R. TAIT McKENZIE, M.D.

DIRECTOR OF THE DEPARTMENT OF PHYSICAL EDUCATION

WHEN Benjamin Franklin, recognized as the founder of the University of Pennsylvania, wrote his famous pamphlet entitled "Proposals for the Education of Youth in Pennsylvania," he incorporated in those proposals the suggestion that the scholars be "frequently exercised in running, leaping, wrestling and swimming."

Therefore, we may safely assume that if Franklin could return today he would not be surprised in the slightest degree to find that running, leaping, wrestling and swimming are still considered worth-while activities at the institution of higher education.

On the other hand, however, there is little doubt that the good Mr. Franklin would be more than amazed to note what a tremendous undertaking it has now become for those institutions to provide adequately, not only for the thousands of students who indulge in those simple sports he recommended, but also for the tens of thousands who follow those sports as spectators.

That our universities and colleges throughout the country are providing increasingly for the physical as well as the mental development of the myriads of students enrolled is no new story to any one today. Scarcely a year elapses that does not see at least one gigantic stadium or gymnasium added to the physical equipment of some American institution, and with each new addition we are reminded of that old phrase annually applied to the circus—"bigger and better than ever."

Whether or not we can safely apply these adjectives to the University of Pennsylvania's recently erected Palestra and Sydney Emlen Hutchinson Gymnasium, we hesitate to say. New ideas in construction work and improvements in other fields are being projected with too much rapidity today to enable any one to advance extravagant claims with any measure of safety.

We at the University of Pennsylvania can safely assert, however, that when these two additions to the University's physical plant were completed, there were placed at the disposal of the student body two of the most completely equipped and thoroughly modern buildings for physical education that could be designed and erected at the time.

Situated on the University's campus in West Philadelphia, and built of brick and steel with limestone facings, the Palestra and the Hutchinson Gymnasium conform in their type of architecture with that of Franklin Field Stadium, which adjoins them and which, as a result of a series of improvements and additions made several years ago, now provides a seating capacity of approximately 80,000.

A Gigantic Indoor Arena Equipped Like an Outdoor Stadium

The Palestra, which we shall describe first, was formally opened on January 1, 1927, with an Intercollegiate League basketball game between Yale and Pennsylvania. It is in reality a gigantic indoor arena with all the appointments usually found in a well-equipped outdoor stadium.

It is built with an ironwork roof and with a wooden floor, although for the sake of accuracy it may be well to state that there are really three floors in the building, the top one being of maple and laid in such a way as to provide the maximum amount of durability. The roof is 75 feet above the playing floor.

The entrances to the building are half-way up the sides, the seats in front of these entrances being backed by a wall which is in sections and can be raised so that the seats in front of the entrances can be slid back in sections when not in use. As a result of this arrangement of the seats, about 10,000 spectators can be accommodated at a basketball game or any other indoor athletic event in which the playing space required does not exceed the size of a basketball court.

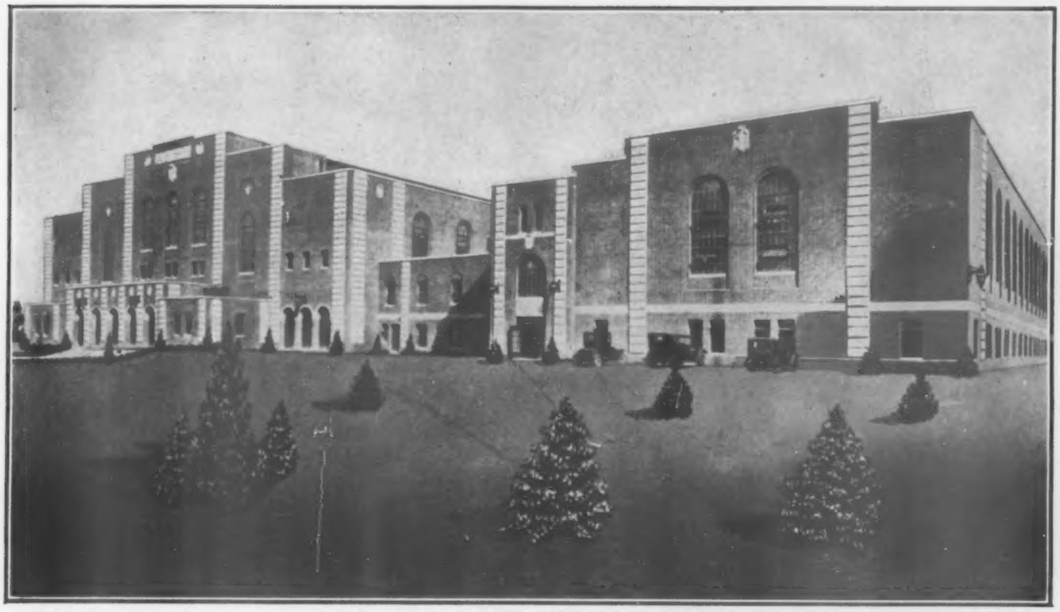
The basketball floor itself, even with the temporary seats in use, is 110 feet long and 65 feet wide. When the temporary seats are pushed back, sufficient room is provided on the floor for three basketball courts.

The building is excellently lighted throughout and is equipped with six dressing-rooms for athletic teams, press-box facilities, radio broadcasting apparatus, and virtually every other feature for the convenience and comfort of athletes, officials, spectators and newspaper men.

The Sydney Emlen Hutchinson Gymnasium, so named in honor of the Chairman of the University's Council on Athletics, who has been an outstanding leader in the development of the institution's athletic and physical education activities, was opened in the fall of 1927.

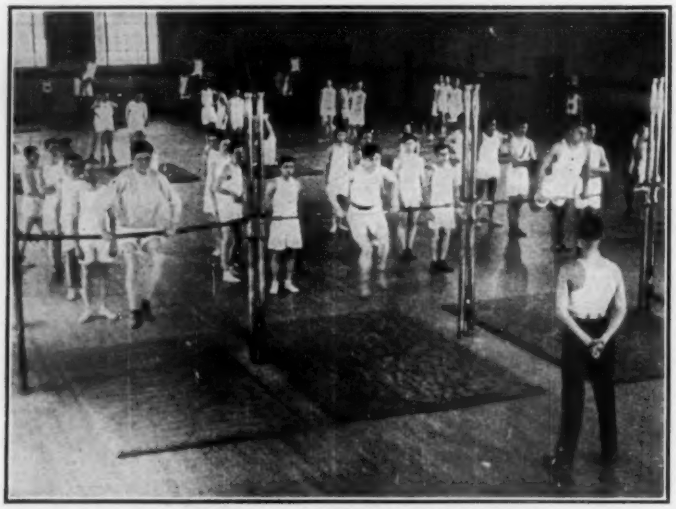
The Gymnasium and Swimming Pool

Adjoining the Palestra, to which it is connected by corridors permitting easy indoor communication



THE PALESTRA (AT LEFT) AND SYDNEY E. HUTCHINSON GYMNASIUM, UNIVERSITY OF PENNSYLVANIA

THE SEATING CAPACITY OF THE PALESTRA IS 10,000



A CLASS AT WORK IN THE GYMNASIUM

between the two buildings, the new gymnasium has a floor 250 feet long and 75 feet wide; a gallery for spectators, and nineteen offices for the staff of the Department of Physical Education of the University.

In addition, there is a swimming pool, which forms the connecting link between the gymnasium and the Palestra and which is divided into two parts. The section known as the "standard pool" is 75 feet long and has a depth of 8 feet. In the second section, which is used for the instruction of beginners, the depth of the water varies from 4 to 6 feet. A gallery with a seating capacity of 1,500 is provided for spectators at aquatic sports.

A laundry, including a drying-room, with unusual equipment for quick service, locker-rooms and service-rooms also are included in the building, while there are four large rooms set aside for boxing, wrestling, fencing and for corrective work in physical education.

Special provisions have been made in various sections of the building which add greatly to its attractiveness and serviceability. The gymnasium floor, for instance, is divided into five units which can be separated by canvas curtains, and there are five entrances, so that each unit can be used without the slightest inconvenience to those in the other units.

The classes for students are run continuously for five hours a day, and the apparatus has been arranged to accommodate a class of 250 students without undue waiting, all the apparatus being arranged in gangs of six, readily set up or removed. One of the five units is reserved for advanced work for the gymnastic team and another for class basketball, the usual class space reserved being 150 by 75 feet. Class work is also carried on in the boxing, fencing and wrestling rooms already mentioned.

In this way the indoor activities of the entire student body are looked after, outdoor activities being taken care of by Franklin Field and the five playing fields situated on the Schuylkill River.

The locker-rooms and the shower-bath rooms are so arranged and equipped as to insure the maximum of comfort and convenience for the students, and a special dressing-room is provided for faculty members of the University.

In brief, the gymnasium embodies every known feature essential to the conduct of a comprehensive program of physical education, and it may well be said that, linked with the Palestra and Franklin Field Stadium, it forms a vastly important unit of an athletic plant of which any university may well be proud.

The following articles on athletic buildings, stadiums, and recreation equipment, of importance to college officials, were published in Volume I of THE AMERICAN SCHOOL AND UNIVERSITY:

"Outdoor Athletic Facilities at School and University," by Gavin Hadden, Civil Engineer, Designer of Athletic Fields and Athletic Buildings and Structures, New York.

"Gymnasiums, Lockers, and Swimming Pools," by Louis Jallade, Architect, New York.

"Features of the Design of the New Swimming Pool of Baltimore City College," by Henry G. Perring, Architect and Engineer, Baltimore.

"The Field House of the University of Iowa," by P. E. Belting, Director of Athletics, State University of Iowa.

THE NEW SWIMMING POOL AT THE UNIVERSITY
The gallery has a capacity of 1,500

VIEW OF EAST END AND SOUTH WALL OF THE UNIVERSITY OF MINNESOTA FIELD HOUSE

The Field House of the University of Minnesota

BY F. W. LUEHRING

DIRECTOR, DEPARTMENT OF PHYSICAL EDUCATION AND ATHLETICS, UNIVERSITY OF MINNESOTA

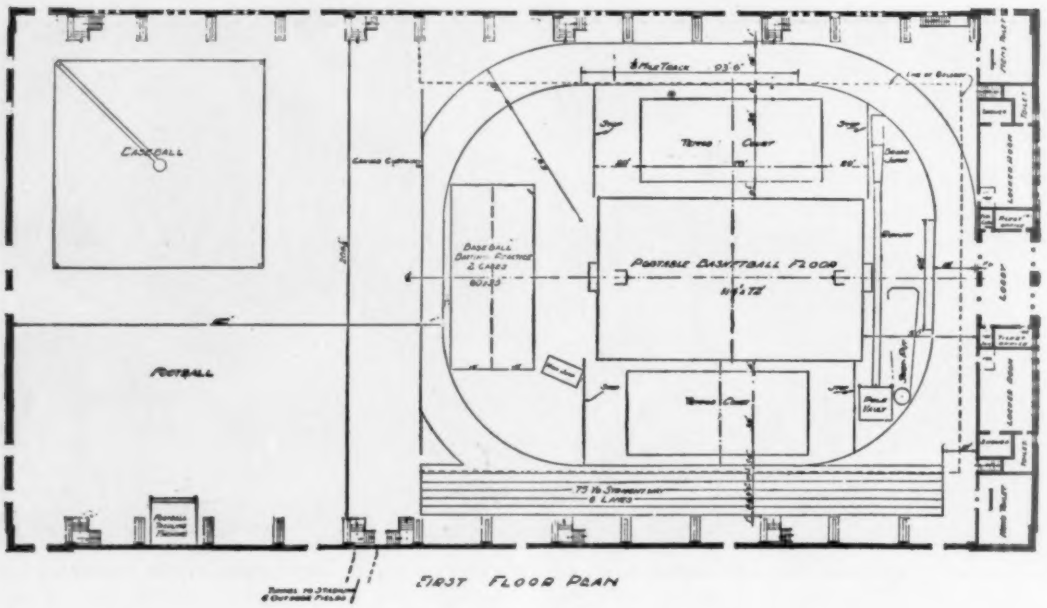
THE new University of Minnesota Field House, completed in the spring of 1928, comprises one of the most interesting physical education buildings to be found in American colleges and universities. Its dimensions are gigantic, 446 feet in length, 234 feet in width and 107 feet in height, making it, so far as is known, the largest single room devoted to physical education activities. Architecturally, it has been made to harmonize with other new buildings of the University, the framework consisting of steel and the walls of colonial brick. Covering most of the block marking the northeast corner of the University campus, its location is admirable; it adjoins other physical education facilities such as the University Memorial Stadium, the interior of which has also received highly intensive treatment for a wide range of University physical education activities, and the adjacent outdoor athletic fields. The Field House is connected with the Stadium locker-room, showers and exercising-rooms and the outdoor fields by means of a tunnel passing under University Avenue, giving easy access back and forth in all conditions of weather.

This huge indoor field structure has been carefully planned and developed to provide for a wide range of physical education activities and permitting much flexibility of program. Classes in the basic introductory course in required physical education, intramural athletic practices and games, varsity and freshman squad practices for football, baseball, track, tennis, basketball, provision for intercollegiate contests in basketball, track, tennis and, if need be, football, can all be accommodated and, with further improvement in acoustics, the building will be also admirably adapted for large convocations, concerts and mass meetings.

The floor surface of the building is made up of a mixture of sand, clay, and sawdust. It is kept in condition by being raked, dragged, sprinkled and rolled. The clay gives firmness of footing, while the sand and sawdust are designed to keep it from getting too hard. Light applications of sawdust also tend to keep the surface moist and free from dust.

Accommodations for Field and Track Athletics

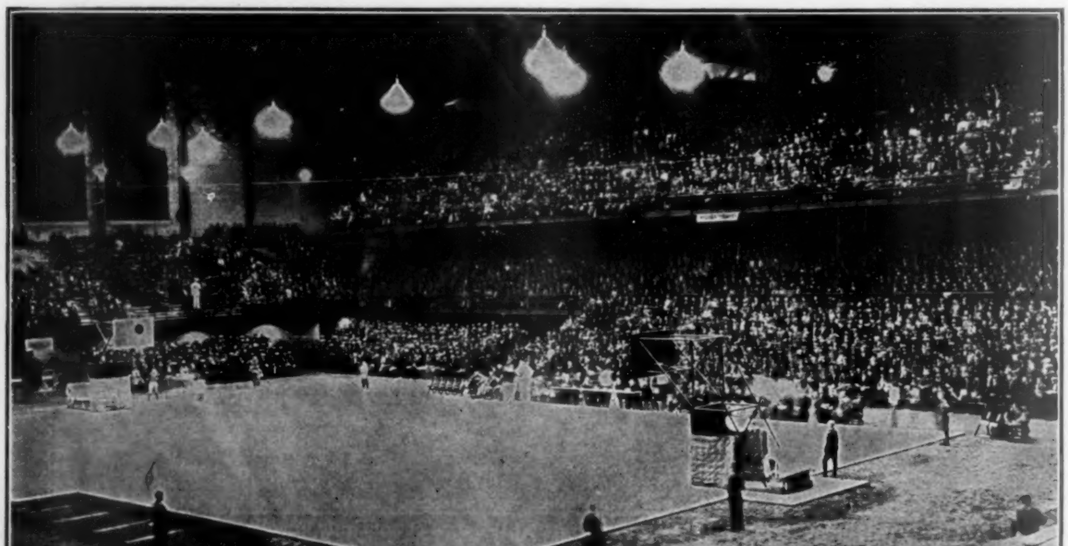
The building is large enough to lay out a full-sized football field if placed lengthwise. It would be possible to play a game of football in the building and accommodate between 15,000 and 20,000 spectators. However, since indoor football games are not at present contemplated, a modified football field of full width and approximately two-thirds in length extends along the west end of the building. This area overlaps the baseball diamond and outfield. At present these two activities are accommodated in part by simultaneous practices, by further subdividing this area, and in part by scheduling these activities at different times,



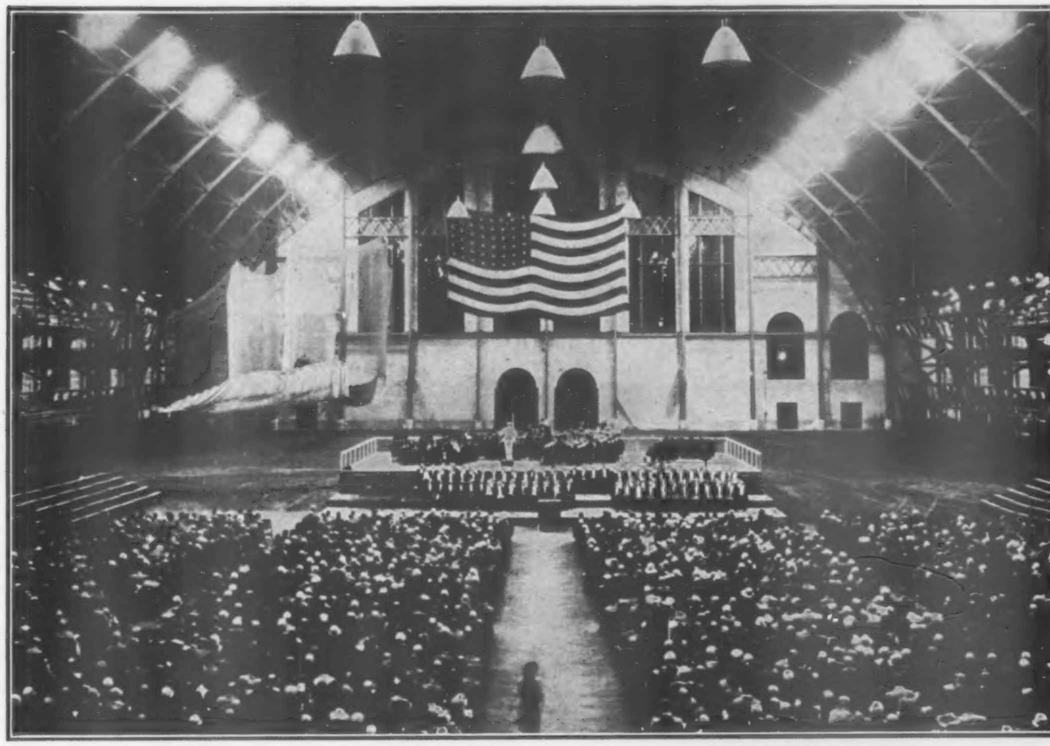
thereby making it possible to occupy the entire area at a given time with a larger number of either football or baseball players. Here also our large classes in required physical education are accommodated for volley-ball, speed-ball, diamond-ball or calisthenics.

In the eastern half of the building has been placed an excellent layout for track and field athletics, comprising a 220-yard cinder and clay mixture running-track, 12 to 20 feet in width, with a 75-yard straightaway, and separate accommodations for pole vault, broad jump, high jump, shot put, etc.

The center of the oval surrounded by the running-track is occupied by a removable sectional basketball floor, 70 feet in width by 115 feet in length, and provided with removable basketball backstops for games and practices.



BASKETBALL GAME BETWEEN OHIO STATE UNIVERSITY AND THE UNIVERSITY OF MINNESOTA, AT THE DEDICATION OF THE FIELD HOUSE



CONCERT BY THE UNIVERSITY OF MINNESOTA BAND, IN THE FIELD HOUSE

Two tennis courts with clay surfaces and with removable net backstops have also been placed within the oval, one court flanking each side of the basketball area. When the removable basketball court is taken out, a third tennis court is provided.

The remaining space in the oval, at the west end of the basketball court, presents two large baseball batting and pitching cages, each 80 feet in length by 18 feet in width and 20 feet in height, with a high jump layout for track nearby. The baseball cages have a flexible installation permitting elevation, lowering or easy removal to accommodate other activities. The remaining space within the oval at the east end of the basketball court provides for running broad jump, pole vault and shot put activities.

Natural and Artificial Lighting

The natural and artificial lighting of this large building has been carefully planned and presents some interesting features. Acres of window space, nearly all of which are placed high up on the ends and sides of the building, make lighting conditions very satisfactory for all activities on bright, sunny days. On dark days such activities as tennis, basketball and baseball are accommodated with such additional artificial light as may be necessary. The artificial electric lighting system is the result of considerable experimentation and careful planning. Large Cahill floodlights were installed because of their remarkable freedom from glare. The lighting installation for basketball and tennis is especially admirable, providing for the delivery of 20 to 22 foot-candlepower of light over the basketball court and tennis courts and 8 foot-candlepower elsewhere, with the light so directed as to deliver it on the sides of the ball, making for better visibility for players. The large roof is entirely free from skylights, thereby avoiding condensation problems which have been a disturbing factor in other similar structures.

Seating Facilities and Lockers

The seating capacity of the building also provides great flexibility. A little over 8,000 permanent seats have been installed in the form of a first and second balcony. The first balcony extends along the east end of the building and along both sides of the building extending from the east end to a little more than half the length of the total structure. The second balcony has been added on the sides. With the basketball court located as at present, it is possible to accommodate 18,500 spectators at a basketball game by adding temporary bleachers to the permanent seats. Should the public interest exceed this, it would be possible to move the basketball court more nearly to the center of the building, complete the balconies for the remaining area, and with the addition of temporary bleachers accommodate at least 25,000 spectators. For a large mass-meeting it would be possible to provide a comfortable seating capacity for 30,000 persons.

The many exits of the building make it possible for a capacity crowd to leave the building comfortably within ten minutes. A radio broadcasting booth, a loud-speaker equipment and a press box are also installed.

Two fair-sized locker-rooms are located on the ground floor at the east end of the building. These are designed to accommodate varsity squads in basketball, track and baseball. The large classes in required physical education, the many students engaged in intramural athletic activities, football and other squads, are provided with ample locker-room and shower facilities in the connected and adjacent Memorial Stadium.

Finances

The cost of the Field House, not including the ground, was $650,000. The funds for its construction have been provided entirely from the receipts from intercollegiate athletics with payments distributed over a period of years by means of a bond issue made by the Senate Committee on Intercollegiate Athletics, with the approval of the Board of Regents.

Construction and Equipment of the University of Minnesota Field House

BY EDWARD S. NELSON, C. E.

OF THE OFFICE OF C. H. JOHNSTON, ARCHITECT, ST. PAUL, MINN.

THE arch trusses which carry the roof and the balconies have a clear span of 220 feet between the 7½-inch bottom pins. The radius of curvature of the upper chord of the trusses is 138 feet and of the lower chord 105 feet. The trusses are 30 feet apart. Each truss has its back post vertical along the brick enclosing walls to a height of about 43 feet. The trusses are made up of Bethlehem shapes using 12-inch, H, G and I sections varying in weight from 28½ pounds to 119½ pounds. It was possible by selecting a large range in weights to keep all of the upper and lower chords and web members of a 12-inch dimension, providing thereby simple gusset plate joints. The chords of trusses are made up in two-, three-, and four-panel lengths, the panel lengths varying in length 10 feet and 12 feet, depending upon the change in the weight of the section. The curves in the chords were made by a "kink" at each panel point. Each truss rests upon a cast steel base bolted to large concrete footings, and the horizontal thrust of the lower pins is resisted by double 12-inch channel ties placed 3 feet below the ground and encased in concrete (see Fig. 1). The top pin of the trusses is 4½ inches in diameter. These trusses were designed for all possible loading combinations, including balconies unloaded or loaded, with or without wind and with or without snow; also for conditions of one or two balconies being loaded on one side of the building and not on the other. The stresses used in the design of the steel work are those recommended by the A. I. S. C. except for shop rivets where 25,000 pounds was allowed for bearing, 12,000 for single shear and field rivets 80 per cent of the above shop value.

The brick enclosing walls and the steel frame supporting the roof and balcony are independent of each other, on account of the difference in coefficient of expansion and contraction of the brick and the steel, and to insure that any movement in the steel roof structure would not cause any pressure against the brick walls. The high brick walls at the two ends are stiffened by a backbone of steel, consisting of steel columns of the plate girder type 3 feet deep (see Figs. 2 and 3), which are anchored at the bottom to concrete foundations, and are anchored at the top to purlin trusses connecting the main roof trusses. These plate girder columns are embedded in the end brick walls and are connected to each other in the wall by other steel frames, so as to allow each end wall to act as one verti-

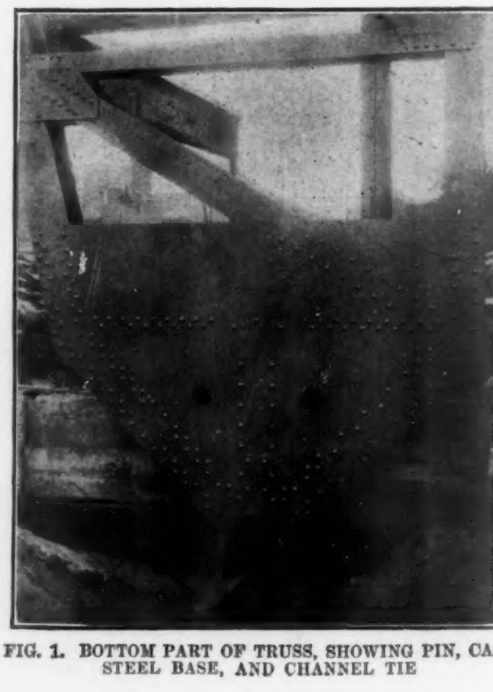


FIG. 1. BOTTOM PART OF TRUSS, SHOWING PIN, CAST STEEL BASE, AND CHANNEL TIE

FIG. 2. SOUTH HALF OF FIRST ARCH ERECTED
Raising first half of first truss; the east wall columns and bracing trusses in the background

heavy slate surfaced asphalt roofing felt of 32-inch width, laid 15 inches to the weather and thoroughly mopped together. To guard against slipping in warm weather on the steep parts of the roof, all of this felt and insulation was fastened through the steel roof deck by means of sheet metal worker's screws, one screw to each 5 square feet. The screws were placed on the selvage edge of the slate-surfaced rolled roofing so as to be covered by the next sheet. It is interesting to note that although the total dead load per square foot of this insulated steel plate roof is only 6 pounds, it has a B.T.U. value of .26 for heat insulation.

The roof was designed for a horizontal wind pressure of 30 pounds per square foot on the steepest part and reducing to 17½ pounds on the flat part. The snow load was figured at 40 pounds per square foot on the flat part and reducing to 10 pounds per square foot on the steepest part of the roof. In addition to the wind pressure, 10 pounds per square foot was added in any event to take care of sleet and ice.

cal matt. On account of the fact that the roof steel framing is riveted for its entire 446-foot length, provision had to be made in the four corners of the building where the end brick walls connect up to the free standing side brick walls, for expansion and contraction due to temperature changes. This was done by means of keyed joints in the brick work with special sheet mastic fillers. Similar keyed expansion joints were provided in the two long brick side walls for their full height.

The main arch trusses are spaced 30 feet apart and are connected together for the full length of the building by deep longitudinal trusses at the panel points (see Fig. 5). Across these longitudinal trusses are placed 8-inch channel purlins, 10 feet apart, and in turn supporting other 5-inch channel purlins at right angles to them spaced approximately 5 feet apart. Alternate bays of main arch trusses are braced at the upper chords by diagonal bracing.

Over the 5-inch channel purlins and clipped to them was placed a roof of the interlocking type, ribbed, copper bearing heavy steel sheets curved at the factory to suit the radius of the roof (see Fig. 4). To provide insulation against heat loss during the winter, the steel sheets were covered on the top with a 1-inch thickness of a patented insulation which was mopped to the steel decking. This was covered by a layer of 15-pound tarred felt, which in turn was mopped and covered with a

Balconies

The first and second tiers of side balconies are supported directly on the trusses by means of connecting trusses between the inner chords of the main trusses, and by connecting I-beams between the back posts of the main trusses. The balcony seats and floors are of plank construction supported on inclined cantilever I-beams fastened to the rear I-beams at the back post line, and carried over the front trusses on the inner chord line. The entire balcony framing is cross-braced against both sway and forward movement. The large single-tier balcony at the end over the offices and other rooms is of the same type of construction, except that the inclined balcony I-beams

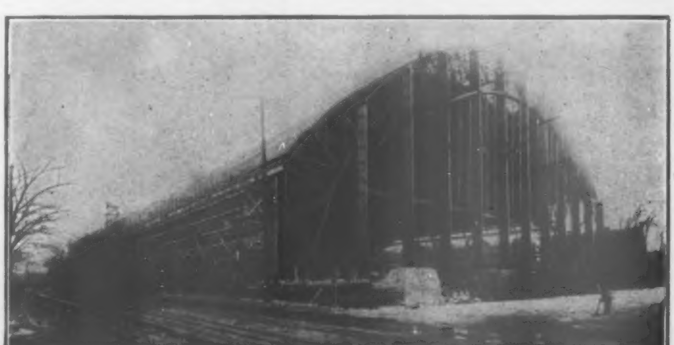


FIG. 3. OPEN WEST END OF THE FIELD HOUSE, SHOWING STEEL PRACTICALLY COMPLETE AND BRICKING-UP OF END WALL STARTED

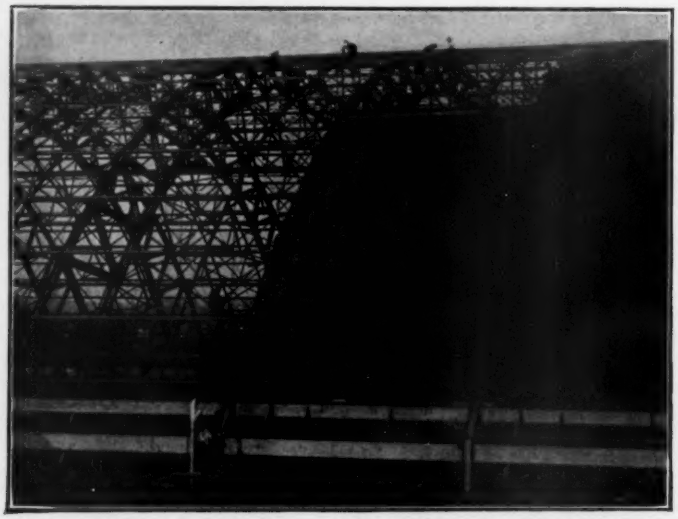


FIG. 4. SIDE VIEW OF ROOF, SHOWING STEEL PLATE ROOF COVERING AND PURLINS

are supported on the steel framing in the end wall, and are supported on posts near the front edge (see Fig. 2).

The live load on the balconies was computed by estimating the number of people who could be seated by crowding, and increasing this static load by 155 per cent to take care of impact. This value was obtained from a series of tests conducted by Prof. A. H. Fuller, Professor of Civil Engineering at the Iowa State College, Ames, Iowa. This percentage of increase was found to be the severest impact obtained from cheering students when the students would rise on their toes at five-second intervals. The load resulted in figuring the balconies for a total load, including the weight of the material, of 150 pounds a square foot.

Special Paint

The shop paint on the steel work was sublimed blue lead, made from a formula prepared by the architect, the pigment composed of sublimed blue lead (basic blue sulphate), zinc oxide (lead free American process), American vermillion (basic lead chromate) and asbestine. The vehicle was raw linseed oil, spar varnish, Japan dryer and U. S. Government specification turpentine substitute. Of the whole, 55 per cent was pigment and 45 per cent vehicle. This paint was found to cover very well, and also resisted abrasion very well. The reason for the selection of this particular paint formula was the result of a long series of tests made on the seacoast near Atlantic City several years ago, in which tests the sublimed blue lead paint showed the best lasting qualities.

Erection

The erection of the steel work proceeded very rapidly after the first truss was erected. The first truss was fabricated and delivered to the job with each half in two pieces. The four pieces were laid out on the ground and each half was riveted up complete. The first half was raised in place and set on the lower pin on the footing. This was found to be very difficult on account of handling and guying the entire half in the air, making it very hard to drive the lower pin (see Fig. 2). The remainder of the trusses were then handled by erecting only the lower third of the truss half, that is, the section from the lower pin to the top of the post. The pin drove very easily. The remainder of the truss half was raised and then riveted to the section already in place. The other half of the truss was handled the same way, the bottom pins and top pin going into place very easily.

Mechanical Equipment

The mechanical equipment consisted of heating, ventilating, water-supply, sewerage and electric lighting.

It was necessary, of course, to have a flexible system of heating and to have the apparatus so placed as to avoid all obstructions to sight lines, balconies and stairways. In the large room the heating system is handled entirely by unit heaters. There were two types used. Those below the balcony are of the so-called unit type consisting of a

FIG. 5. LAST HALF OF LAST TRUSS IN PLACE, AND FIRST HALF BEING SLIPPED DOWN TO HAVE TOP PIN MEET

tubular heater with an electric-driven propeller fan, and in most cases there was a suction duct carrying down to approximately 2 feet above the floor line in order to pick up cold air which would normally remain on the floor, and to heat it and discharge it beneath the balconies. The main heaters consisted of high-speed direct-connected fans mounted on platforms between the upper and lower balconies, taking the air normally from the space above the balcony and discharging it through ducts terminating along the roof line above the second balcony. The greater portion of this air is discharged downward by deflectors and towards the center of the building, and the smaller portion is allowed to follow the curve of the roof to offset the cooling effect of the large roof area. There are 21 unit heaters below the first balcony and 12 main heaters between the first and second balconies. The combined air-moving capacity of the fans is 186,000 cubic feet per minute, sufficient to rotate the entire cubical contents in approximately 45 minutes. Flexibility in heating is obtained by operating as many heaters as is necessary, depending upon weather conditions.

Because of the large size of the building, it was not thought necessary to introduce air from the outside for ventilation purposes. However, the 12 main heaters are connected to outside ventilating louvres near the top of the brick side walls to pick up cold, dry air from the outside to be heated and introduced into the building, if necessary, to overcome any fog conditions from a large audience in cold weather. These ventilators are also available to run with exhaust fans in the summer in case the building should become overheated. It is possible to raise the temperature within the building at the floor level and in the balcony levels to 70 degrees F. with the usual average winter temperature in this climate. However, on account of athletic contests and exercises it has been found that the temperature has to be reduced to approximately 60 degrees. That section of the building consisting of offices and other rooms is heated by direct radiation. The heat is obtained from high-pressure steam brought through underground tunnels from the central heating plant approximately four-fifths of a mile distant. Pressure is automatically reduced at the building and low-pressure steam distributed to the heating units. On account of the heavy weight of the older type of cast iron heaters to suspend from the trusses, heaters of seamless copper tubing type were used with fans behind them having direct-connected motors. The electrical controls for the heaters are located at several points along the walls so that any of the heaters may be started or stopped at the main floor level.

The plumbing work consists of 16 8-inch rainwater leaders to take care of roof drainage which collects on the two long sides of the building in 6-foot wide wood framed gutters, which are of the pitch and gravel type flashed to the brick side walls and connected to the asphalt and slate-surfaced rolled roofing on the circular roof. The plumbing system also takes care of the large public toilets on the first and second floors, and provides for the shower-rooms for the University and visiting teams. Showers are provided with thermostatic control to prevent scalding. Drinking water is taken care of by means of fountains installed at many accessible points.

Illumination

The illumination presented a difficult problem. It was decided after a study of other field houses, armories and the Madison Square Garden, New York, that the type to be adopted was large projector units located at various points in the roof structure. The lighting consists of 76 reflector type lamps, each lamp having a 2,000-watt lighting element. In addition, over the basketball court other units are suspended on adjustable hangers. The maintenance of the large reflector type lamps in the ceiling was provided for by convenient "catwalks" such as are built into the interior of dirigibles, to make the lamps easily accessible. This illumination is found to be exceptionally free from all shadows, gives an even intensity in all directions and is without glare of any kind. The lighting is controlled remotely through a switchboard.

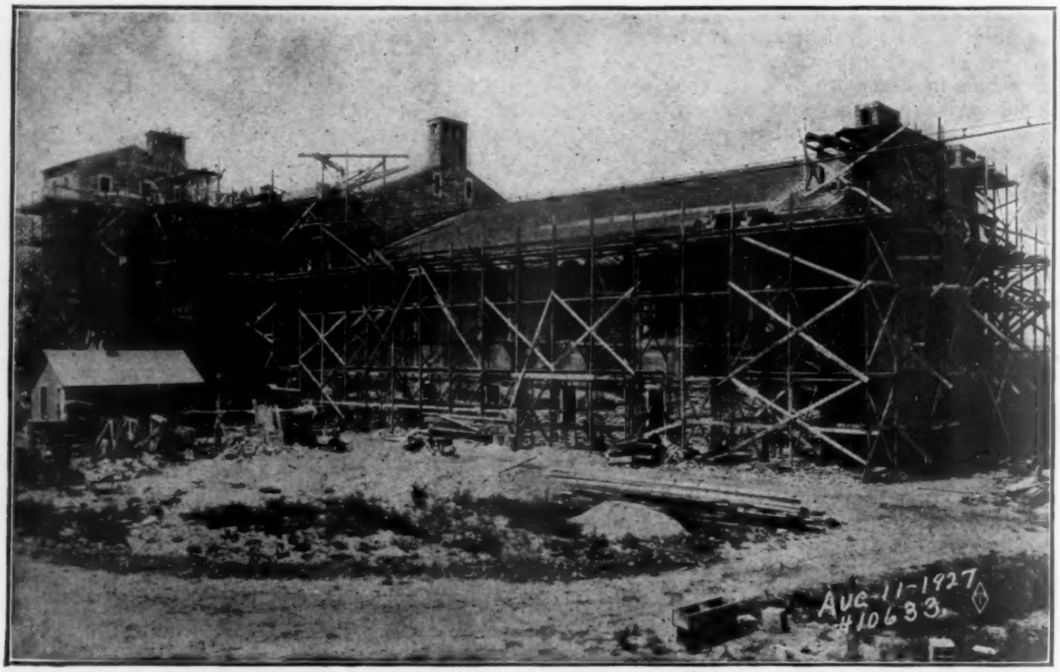
The plans for the work started in the fall of 1926, and were completed in the spring of 1927, and contracts were let immediately and work started on May 1, 1927. The building was entirely completed and the first basketball game played on March 4, 1928.

It is interesting to note that during the construction of this unusual type of building, which was rushed through as quickly as possible, carrying the work on through an exceptionally bad winter, not a single injury resulted to anyone.

Personnel

The architect for the Field House is Clarence H. Johnston, St. Paul, Minn. Edward S. Nelson, of Mr. Johnston's office, laid out and supervised the structural design, the details for which were worked out by C. Warren Durr, office engineer. The mechanical equipment work was handled by the Pillsbury Engineering Company, of Minneapolis and St. Paul. The general contractor was the Madsen Construction Company, of Minneapolis, steel was fabricated by the Minneapolis Steel & Machinery Company, of Minneapolis, and the erection was done by Walter DeFreres, of St. Paul. The heating contractor was H. Kelly & Company, of Minneapolis. The plumbing contractor was the J. W. Scott Company, of Minneapolis. The electrical work was handled by the Minneapolis Electric & Construction Company, of Minneapolis. The superintendent of construction was W. B. Marschner.

Author's Note: For further details see article by the writer on Engineering Features of the University of Minnesota Field House, in the *American Architect* for September 5, 1928. This article contains several reproductions from the tracings of typical sections of the building and various construction details. A limited number of reprints of this article are available upon application to the author. The engineering features of the Field House were also described in the *Engineering News-Record* of April 12, 1928.



BUILDING THE WOMEN'S GYMNASIUM AT THE UNIVERSITY OF COLORADO

The Construction Department of the University of Colorado acts in the capacity of a general contractor in the erection of new buildings.

MEN'S GYMNASIUM, UNDER CONSTRUCTION

(See article on pages 48-50, on Organization and Activities of the Construction Department of the University of Colorado.)

BOYS' FIELD HOUSE, OAK PARK AND RIVER FOREST TOWNSHIP HIGH SCHOOL, OAK PARK, ILL.

New Physical Education Buildings of the Oak Park and River Forest Township High School

BY FRANK A. CHILDS

CHILDS & SMITH, ARCHITECTS, CHICAGO, ILL.

THE new buildings for the physical training work in the Oak Park and River Forest Township High School in Oak Park, Ill., which is about eight miles west of Chicago, are quite a departure from the usual high school athletic program.

While the Boys' Field House resembles very closely the university type, the provision for its use by every one of the present enrollment of 1,614 boys, and a contemplated future enrollment of 2,500 boys, has made a distinct change in the planning of locker- and shower-rooms and other attendant features. The present buildings are only the first units of a very comprehensive program, which aims to take care of a future total enrollment of 5,000 students, and to give every boy and girl an hour a day in physical education. This means that at the present time nearly 400 pupils will use the buildings each period of the day.

Medical examinations are given by a corps of physicians sent by the Physicians Club of Oak Park, under the direct supervision of the Commissioner of Health. Physical examinations are given by the teachers in the departments, assisted by the school nurse. The results of these examinations determine the proper amount and kind of work best suited to the pupil's needs.

The Boys' Field House is 193 x 246 feet. The Girls' Gymnasium Building is 125 x 171 feet. Together they have a cubic content of 2,483,520 cubic feet, which, at a total cost of $732,487,

ENTRANCE LOBBY, BOYS' FIELD HOUSE

MAIN LOBBY, GIRLS' GYMNASIUM BUILDING

represents a building cost of 20.3 cents per cubic foot, and a complete cost, inclusive of mechanical equipment and fixtures, architects' fees, etc., of 35 cents per cubic foot.

In each case, it was the endeavor to produce as nearly as possible outside conditions as to light and air in all rooms inside the buildings. The two buildings are serviced by three full-time men and one additional man for each building after 3 P. M.

Boys' Field House

The Boys' Field House has a clear height of 30 feet under the trusses, is lighted on three sides by large windows, with a roof skylight 44 x 140 feet. It contains along one side 1,200 permanent bleachers, which can be extended, by means of temporary bleachers, to accommodate 5,000 spectators for basketball games, and 8,000 for commencement and other activities of a similar nature. There is a field proper 128 x 240 feet, with a running-track, nine laps to a mile, which is sprinkled twice a day.

The playing floor, 64 x 120 feet, located at one end of the field, is provided with three practice baskets on the side, with a regulation basketball court, 48 x 84 feet. The high jump and pole vault are taken care of in pits, 8 x 12 feet and 14 feet square respectively, each 12 inches deep, filled with tan bark.

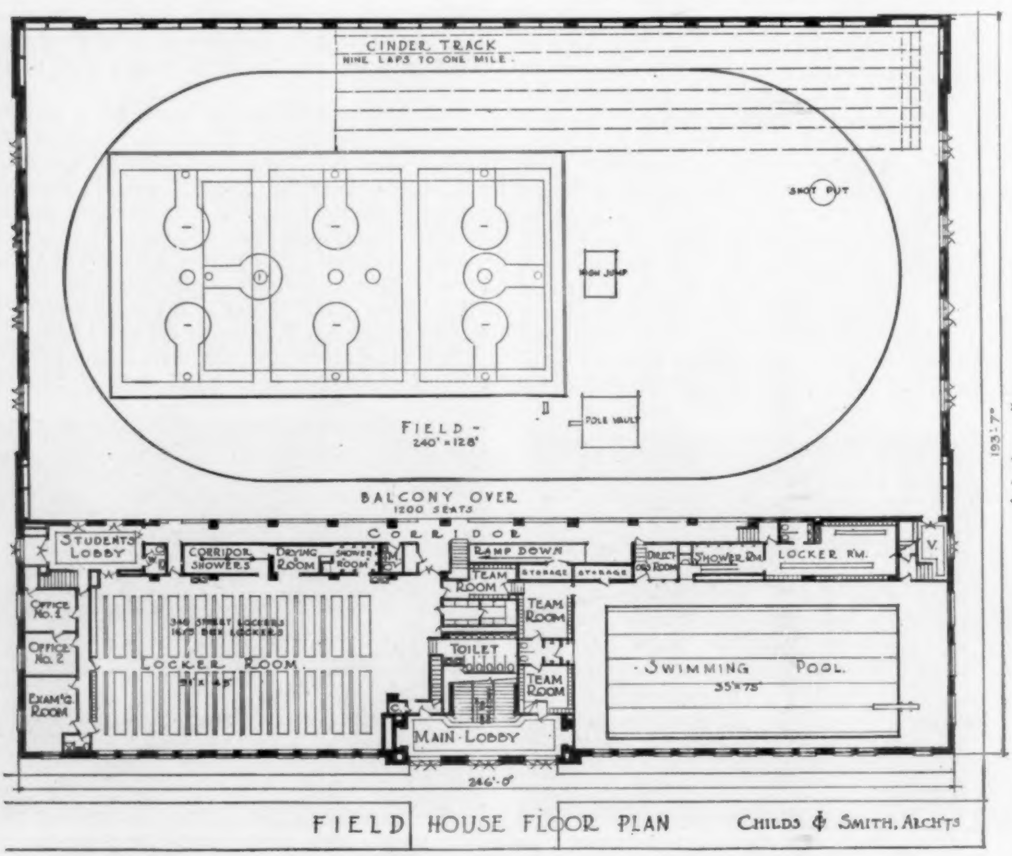
There are four full-time instructors, with two half-time and eight regular classes daily, divided into five sections, according to school and year; 250 boys are accommodated at one time. Two sections work on the floor, two on the track and field, and one in the swimming pool.

The track and field activities are: starting and sprinting; hurdling; standing and running broad jump; high jumping; shot putting; relay racing. The floor activities are: marching, calisthenics; group games; relays; free throwing; basket shooting; basketball games. This gives each boy a balanced program, with two days on the floor, two on the track, and one in the swimming pool.

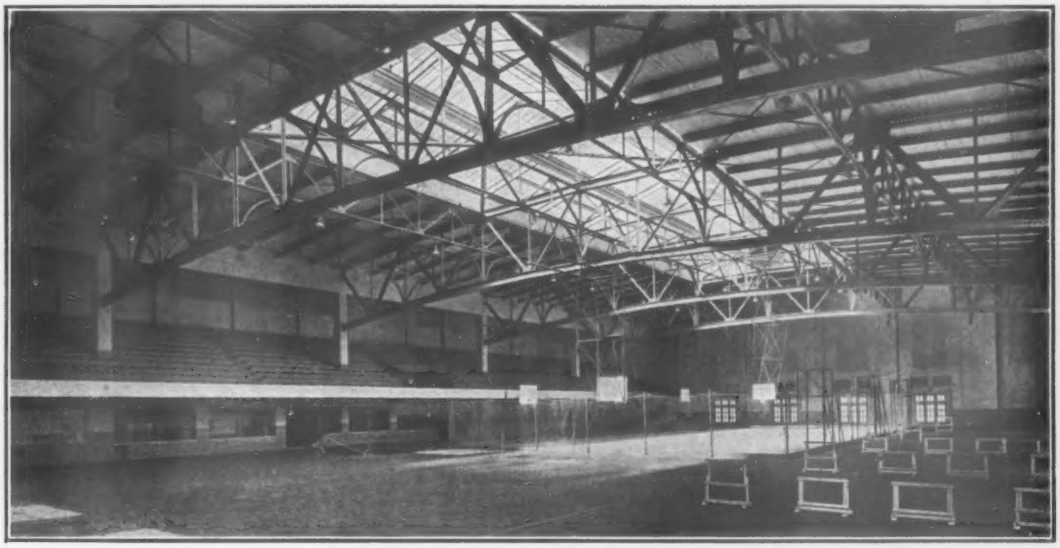
Out of 1,614 boys, modified exercise is prescribed for 100 boys, and only 15 are excused from all forms of exercise. The athletic teams use the Field House after school daily, including the track, swimming pool, and three squads of basketball—Freshmen, Sophomores, light weight and heavy weight.

LOCKERS

Each boy is assigned a small box locker in which to keep his gymnasium uniform, this locker being protected by a combination padlock. When he enters the locker-room, he places his street clothes in a large street locker, to which he transfers the padlock. On his return to the locker-room, his gymnasium suit is again placed in the



FIELD HOUSE FLOOR PLAN — CHILDS & SMITH, ARCH'TS



INTERIOR OF THE BOYS' FIELD HOUSE

small locker and the padlock returned to it, leaving the large street locker available to some other boy for the following period. In order to accommodate the eight regular classes, these small box lockers are arranged in the proportion of 8 to 1 of the street lockers.

LOCKER-ROOM

This locker-room is 45 x 91 feet. It is accessible from two entrances and is separated from three administration offices by a small corridor. It has a ceiling height of 14 feet.

There is a corridor shower which is used after each class. This shower is continuous for 40 feet, with four temperatures of water, starting with 90 to 98°, then to 85°, and ending with 70°. It accommodates 50 boys per minute.

There is also an individual shower-room and drying-room, with team-room, storeroom and toilets adjoining.

SWIMMING POOL

On the other side of the main lobby is a swimming pool, 35 x 75 feet, with a spectators' balcony accommodating 500. Adjoining the pool are three team-rooms, locker- and shower-rooms, complete with individual showers, wading pool and douche rail. In the pool, there are eight classes a day of from 40 to 60 each, in 40-minute periods, of which 25 minutes is actually spent in the pool. The other 15 minutes is occupied by undressing, examination, shower, and dressing.

The swimming pool, including the curb, the scum gutters, and the recessed ladders, is of ¾-inch white ceramic mosaic. The inside of the pool has black guide and depth letters. The pool is 3½ feet deep at the shallow end, 5 feet at the opposite end, and 8 feet in the deepest part. The floor of the pool room is of 1 x 2 non-slip Lombardic tile, with black border and decorated tile inserts. The walls are laid up in gray glazed brick. The ceiling is acoustically treated with hair felt and metal, secured with copper nails.

Every possible precaution is taken to protect and insure the health of the pupils. The water in both the boys' and girls' pools is circulated through filters, the entire amount passing through every twelve hours. It is purified with chlorine gas by means of automatic chlorinators. Fresh water is added continually, causing an overflow of surface water. The water is analyzed three times a week by the Oak Park Department of Health, and this is supplemented by other analyses in the school.

The pools are cared for by one man full time and one additional after three o'clock. They are vacuum-cleaned three times a week, and the scum gutter, deck and floors of locker-rooms are mopped three times a week with an application of formaldehyde to prevent ringworm or "athletic foot."

A clean towel is furnished each pupil after the daily shower, which is required after exercise on the floor or before entering the pool. For the towel service, a uniform fee of $1 per semester is charged, which covers about only one-half of the actual cost. This fee will approximately cover the cost when the installation of the laundry is completed.

HEATING AND VENTILATING

The Field House is heated by radiators below windows along the outside wall, concealed behind the glazed brick wainscot, and by heaters and fans in the penthouses on the roof.

A complete supply and exhaust ventilation system is furnished for the swimming pool, locker- and shower-rooms by fans and heaters located in the basement.

FUTURE UNITS

The future development of the Field House provides for three additional floors, which will

house among other things, a gymnasium 100 x 40 feet, a hand-ball and squash courts, special rooms for the faculty, a large entrance and trophy hall, combined with retiring-rooms for men and women, a social hall, club-rooms, and other facilities which may be deemed necessary five or ten years hence.

Girls' Gymnasium Building

In the preliminary examination of all girls, the silhouettegraph plays an important part. Throughout the year, records are taken of weight and measurements, and these are specially charted in a graph to note progress.

Six instructors take care of an enrollment of 1,506 girls—two for swimming and four for gymnasium work. There are seven gymnasium classes a day, 40 minutes each. Seven minutes after a bell is sounded, all must be on the floor; eleven minutes are allowed for shower and dressing at the end of each period, thus giving 22 minutes for actual exercise.

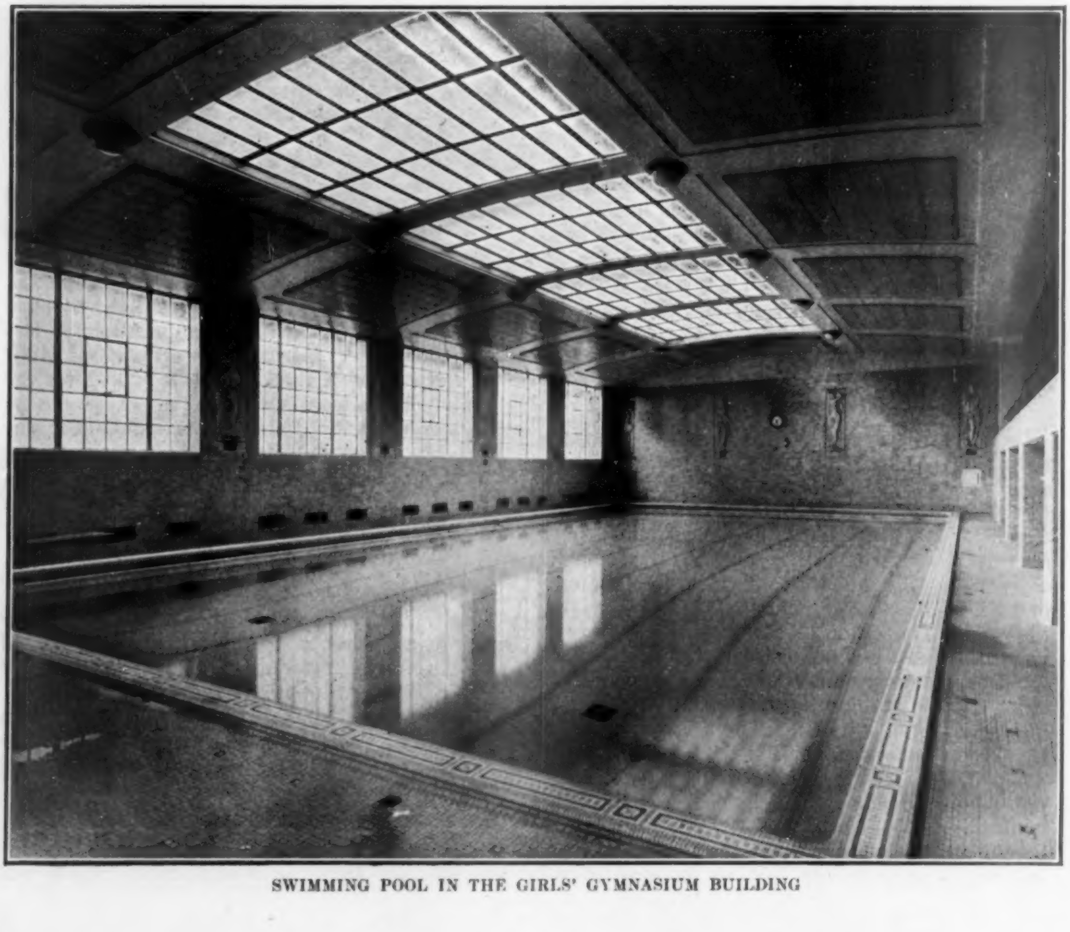
The main or general group classes range from 80 to 110; the corrective groups, about 60. Out of the entire enrollment, there are only 103 who are excused from any form of exercise.

SWIMMING POOL

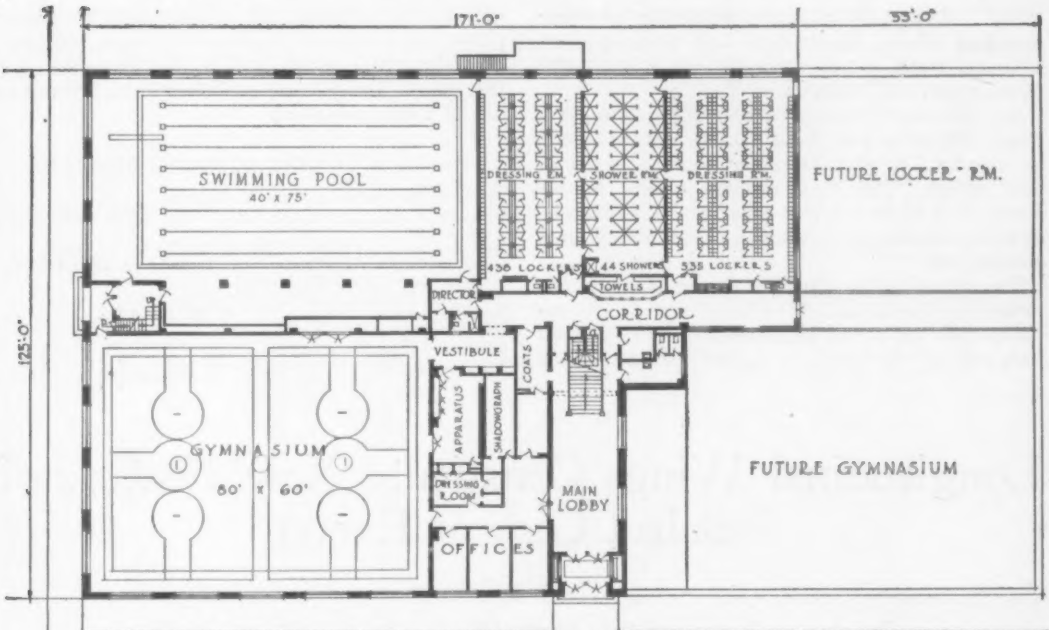
Before entering the pool, each pupil is examined for foot trouble, such as ringworm and plantar warts; bath shoes are required to be worn to the floor of the swimming pool; 3 x 3 dressing-rooms are provided with individual hair dryer for each girl. After donning her tank suit, which is of heather-gray cotton and uniform in style, she proceeds to the shower. After swimming, another shower is taken and the student proceeds to the dressing-room robed in a 24 x 60 bath towel. The suit is disposed of in a chute to the laundry, and on the way out, the towel is disposed of in the same way and is taken care of by an attendant.

There are seven periods of swimming and approximately 60 in a class. The posture classes swim on Monday, the Freshmen on Tuesday, and the general upper classes on Wednesday and Friday. After school, there are special classes in life-saving and diving. Approximately 20 minutes is devoted to undressing, examination, showers and dressing before entering the pool, which gives about 20 minutes actual time in the water.

The swimming pool is composed of the same materials as used in the boys' pool, except that delft blue is employed instead of black. The size



SWIMMING POOL IN THE GIRLS' GYMNASIUM BUILDING



FLOOR PLAN

GIRLS PHYSICAL EDUCATION BUILDING CHILDS & SMITH, ARCH'TS

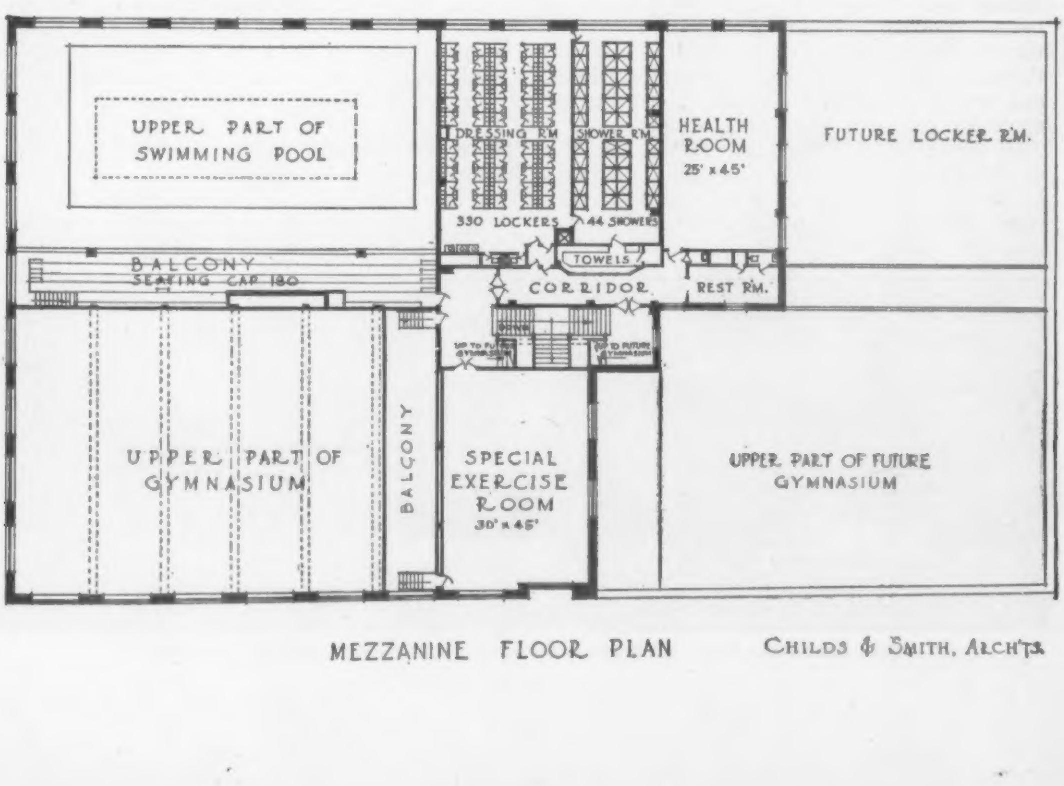
SCOVILLE AVE.

of the pool is 40 x 75 feet. The pool room is decorated by wall panels of the Jean Goujon Nymphs, which were imported especially for the purpose from the Louvre in Paris. These panels are enclosed in a 3-inch frame of blue delft ceramic mosaic, the same as are used for the guide lines of the pool, which makes a very pleasing addition of color in the gray glazed brick walls.

The natural lighting on the two sides of the pool is augmented by an overhead skylight in a vaulted ceiling, providing sunlight in every corner.

GYMNASIUM AND HEALTH ROOM

The present building includes, besides the swimming pool, a gymnasium 60 x 80 feet, 159 dressing-rooms 3 x 3, 88 showers, a main entrance



MEZZANINE FLOOR PLAN CHILDS & SMITH, ARCH'TS

lobby, administration space consisting of three directors' offices, examination and dressing-room, silhouettegraph room, apparatus room, coat and check room, and toilets.

On the second floor is a special exercise room where 350 girls who have faulty posture habits or structural disabilities receive work of a remedial nature. This floor includes also a Health Room 25 x 45 feet, a rest room, and a spectators' balcony for the gymnasium and swimming pool seating 180.

The future plans will take care of an approximate enrollment of 2,500 students, and will include four additional gymnasiums, each 60 x 80 feet, one of which will be in the open air. Two of these gymnasiums will be separated by rolling partitions, which will be thrown together for large gatherings and which will have bleachers, over the added locker- and shower-rooms, accommodating 1,000 spectators.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Drinking Fountains—Halsey W. Taylor Co.
Gymnasium Equipment and Furniture—Chicago Gymnasium Equipment Co.
Heat Regulation System—Johnson Service Co.
Lighting Globes and Fixtures—MacBeth-Evans Glass Co.
Lockers—Lyon Metal Products Co.
Plumbing Fixtures and Showers—Crane Co.
Piping—National Tube Co. and A. M. Byers Co.
Radiators—American Radiator Co.
Swimming Pool Equipment—Everson Fitter Co.
Ventilating Fans—American Blower Corp.

Longitudinal Wings Constitute New Feature of Baseball Cage at Exeter

BY JOSEPH S. FORD

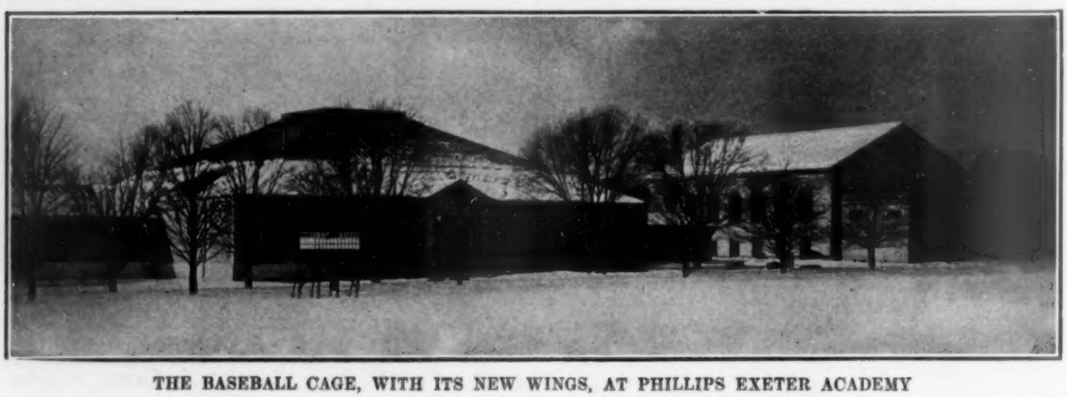
DIRECTOR OF ADMISSIONS, THE PHILLIPS EXETER ACADEMY, EXETER, N. H.

THE new baseball cage at Exeter is the gift of Colonel William Boyce Thompson, of the class of '90. It was planned to give the largest opportunity for winter practice to all those interested in baseball and in track sports. The buildings of this type which have been completed recently at the different colleges and schools have been erected on the same general structural principles, namely, a square of 160 feet to the side, with a frame of steel and side walls of brick and hollow tile. It has seemed hardly practical to increase the dimensions of the square, because of the engineering principles involved. Even with these dimensions, the thrust of the diagonal beams and the play to be allowed for contraction and expansion has been a problem to meet.

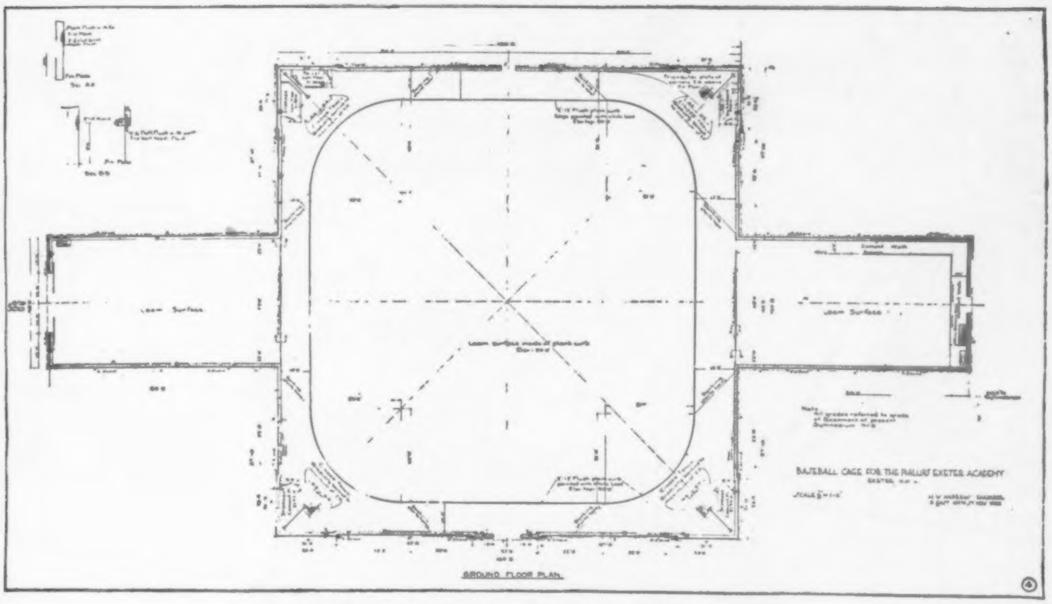
It has appeared, therefore, that a limit of available space had been reached. Since, however, buildings of this type are always used for track sports, as well as for baseball, it occurred to those who were working on the details of the plan at Exeter that longitudinal wings might be added which would provide space for the field events, such as the jumps, the pole-vault and the shot-put, while the baseball work was going on, and which would add greatly to the facilities for the dashes and hurdle races, when used in connection with the main surface.

These wings constitute the new feature of the Exeter cage. They are 80 feet long and 45 feet wide. The whole distance available for the running events is accordingly 320 feet. In order to give additional space for the finish of the hundred-yards dash, there are sliding doors at the far end which can be opened when this distance is used in competition or in practice.

The exterior is of Indiana limestone and brick, with an interior lining of hollow tile. The lighting is for the most part from overhead, the roof being heavy glass (especially made with wire rein-



THE BASEBALL CAGE, WITH ITS NEW WINGS, AT PHILLIPS EXETER ACADEMY



GROUND FLOOR PLAN OF THE BASEBALL CAGE

forcement) down to within 20 feet of the eaves. For dark days or late afternoon work there are 56 overhead lights, each of 750 watts.

The building is warmed by six unit heaters of the blower type. Air from outside is drawn in over hot steam pipes and forced into the cage by electric fans, the stale air passing off through ventilators in the roof.

ARCHITECTS AND ENGINEER

Designer of the Building—Corning Benton, of the Exeter Faculty

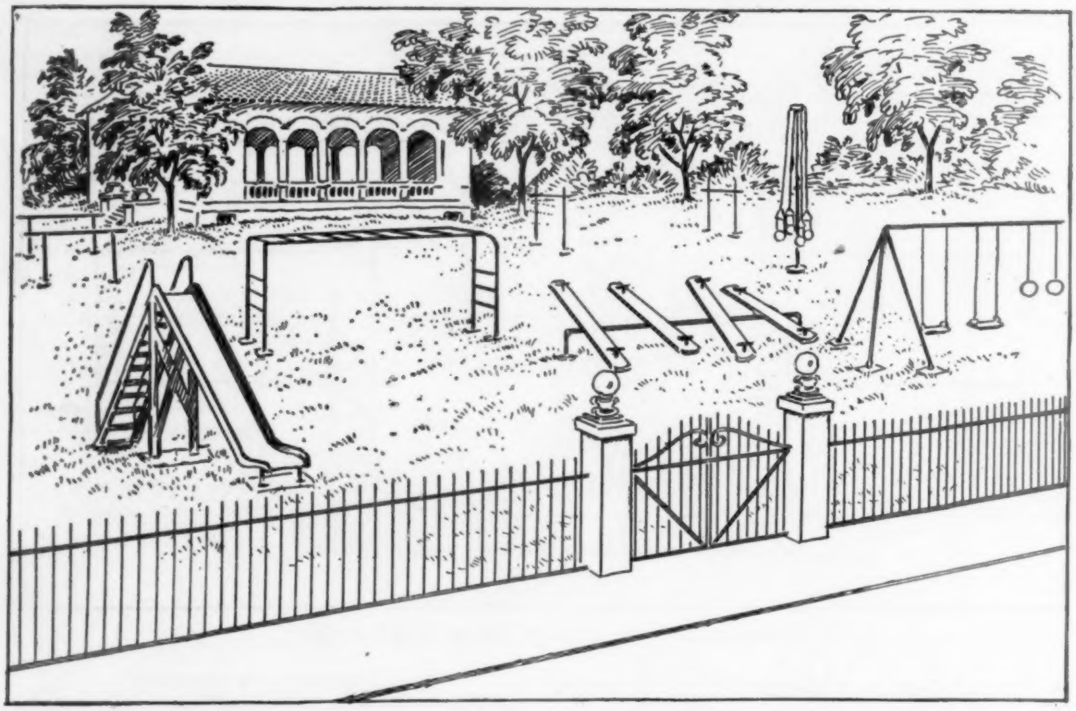
Engineer, Harry W. Andrews, New York; assisted in exterior design and location by Cram and Ferguson, of Boston, and F. A. Colby, of New York

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Heating and Ventilating System—T. A. Ridder Co.
Roofing—C. J. Bostwick
Windows and Sash—Carl J. Olson & Sons

THE GYMNASIUM AT PHILLIPS EXETER ACADEMY

PLAYGROUNDS WITHOUT CHILDREN—



AND CHILDREN WITHOUT PLAYGROUNDS

The accompanying cartoons from *The American City* illustrate a problem being faced by many municipalities. Better cooperation between boards of education and public recreation officials would solve it in many places. Almost everywhere school playgrounds can be used more continuously than they are, while proposed public playgrounds can often be located adjacent to, or close by, public schools.

Modern Trends in the Design and Equipment of Public School Playgrounds

BY CHARLES J. STOREY

RECREATION DEPARTMENT, RUSSELL SAGE FOUNDATION

THERE was a time when the school playground was looked on as a sort of overflow space for the children when they were released from the classroom for a recess or noonday period. To-day, the modern school playground is as much a classroom as any other part of the school. Physical education programs take the child out of doors in games and athletics, and this demand for facilities, together with the modern attitude toward children's play, is responsible for the interesting developments in school playgrounds in recent years.

The increasing size of school sites all over the country is indicative of the place recreation and physical development have taken in the school curriculum. And the generosity of municipalities in providing sites of 25 to 50, or even 80, acres certainly shows the changed attitude of boards of education toward community use of school property. With the increased time devoted to physical education, outdoor play and athletics extend more and more into after-school hours, with the resulting need of facilities to care for those leisure-time recreational activities which at one time the school had nothing to do with.

An inquiry was recently made by the National Conference on City Planning into the size of school sites acquired by 171 cities in the previous ten years, and it was found that almost a third of the sites purchased for elementary schools were over five acres in size, and almost two-thirds of the high school sites were also over that area. The following table compiled from these data shows this development clearly:

NUMBER AND AREA OF SCHOOL SITES ACQUIRED
1915 to 1926

IN CERTAIN CITIES OF THE UNITED STATES

Cities Grouped by Size Pop.—No. of Cities	Total Sites Acquired	Sites Over Five Acres	Per Cent of Sites Acquired
Population 15,000-50,000 113 cities			
Elementary schools	310	119	38.4
High schools	66	39	59.0
Pop. 50-000-100,000 32 cities			
Elementary schools	190	63	33.1
High schools	25	19	76.0
Pop. 100,000-250,000 18 cities			
Elementary schools	147	39	26.6
High schools	23	17	74.0
Pop. 250,000 and over 8 cities			
Elementary schools	228	56	24.6
High schools	32	14	44.0
Total elementary	875	277	31.6
Total high schools .... 171 cities	146	89	61.0
Grand Total	1,021	366	35.8

It will be readily seen that the smaller cities have the largest proportion of elementary sites over five acres, due no doubt to having large, sparsely unbuilt acreage which can be secured at reasonable prices. The modern practice of locating high schools toward the outer edge of a city, thereby securing the benefit of travel for the pupils in morning and evening in the opposite direction to that of workers, has helped to secure larger desirable locations. Some of the larger high school sites were reported from Shawnee, Okla., 80 acres; Harrisburg, Pa., 35 and 43 acres; and Green Bay, Wis., 23 acres. New Britain, Conn., has an elementary school site of 18 acres; Leavenworth, Kans., has one of 18 acres; and Mason City, Iowa, has provided a 29-acre site for an elementary school, an athletic field and a park.

With this decided trend toward larger school sites come newer uses, some of which are other than recreational. In Sacramento, one of the senior high school grounds (30 acres) has an orchard and a space for botany and plant sciences. In the city of Winston-Salem, N. C., there is only one city park, but other park and playground space is provided by the extremely large school sites, some of 30, 40 and 75 acres. A number of cities are developing large school grounds in a park-like manner by planting them with shrubbery and groves of trees.

Progressive cities have now definite minimum requirements for the size of school sites, based of course on the necessity for playground and athletic field areas in connection with the schools. Sixty cities out of the 1,021 reporting to the Conference on City Planning, indicated a policy of securing five acres or more for elementary schools, and ten acres or more for high schools. An authoritative standard is five acres for elementary, ten for junior high, and twenty acres for high schools.

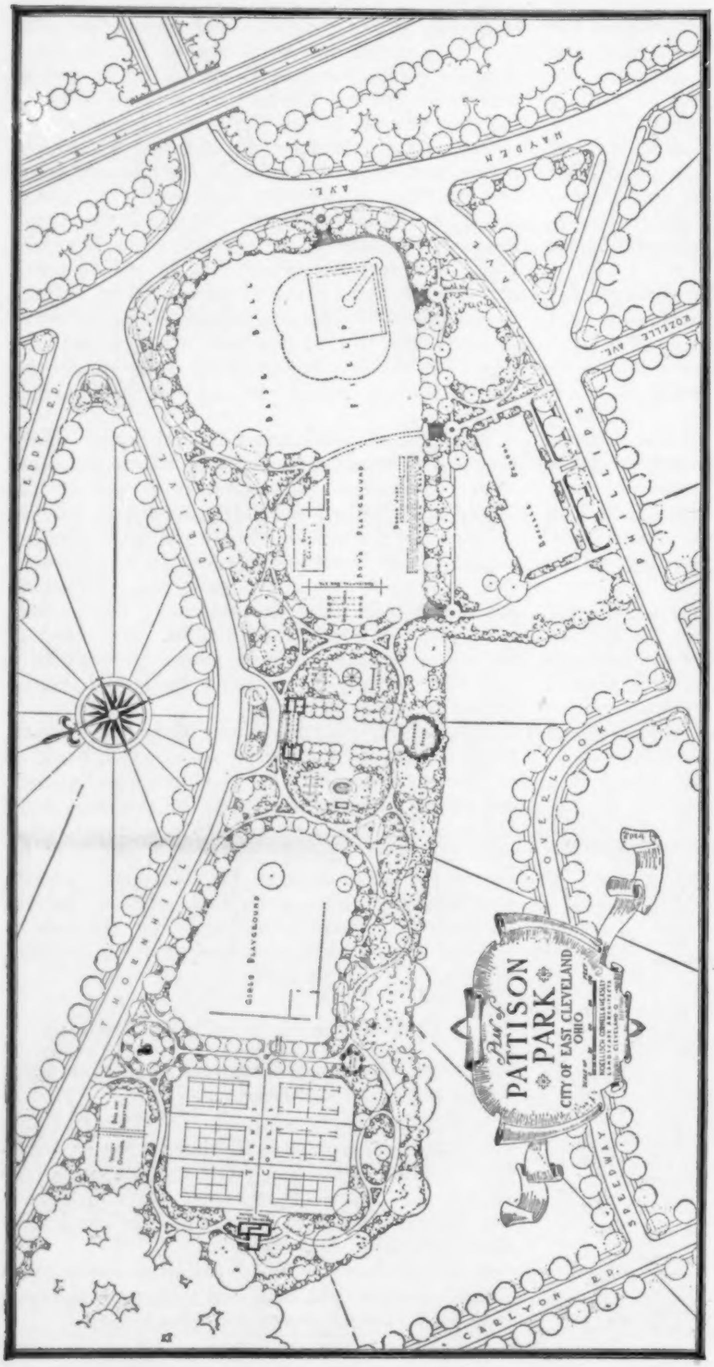
Four Types of School Play Space

Existing school play space is of about four types which might be described as:

1. Small exercise yard.
2. Large playground with play apparatus, handball courts, basketball courts and space for games.
3. Playground with apparatus for small children, and large play field.
4. Playground for small children, and a more formal athletic field equipped with running-track, ball fields, tennis courts and grandstands.

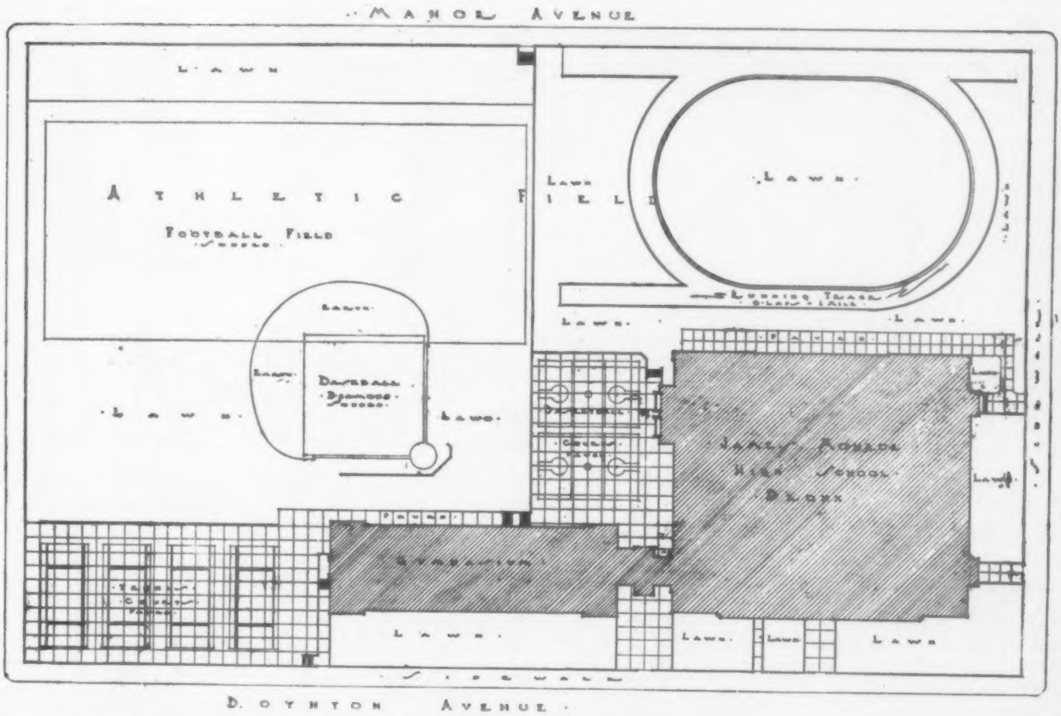
The exercise yard is the old-style playground, which, unfortunately, is not obsolete, especially in the larger cities. Modern planning has discarded it completely and we now find in many elementary schools the large playground with a certain amount of apparatus such as swings, slides, etc., and often handball and basketball courts. In cities where space is restricted, the ball-playing is confined to playground ball. Play apparatus for small children, including swings, slides, seesaws and giant strides, is useful, especially in small country schools where the teacher cannot give much time to the supervision of outside play.

Number 3 of the above types is on the increase, especially in smaller cities and growing communities. Often, on elementary grounds, the athletic field takes the form of a play field, not always equipped with a track or grandstand, but laid out for baseball, football, soccer, etc., and suitable for children of elementary school age. The Pattison Park school playground in East Cleveland, a plan of which is reproduced, is of this type.



Where play space is intended to serve children of both elementary and high school age, a small children's playground and a fully equipped athletic field are included. This is well illustrated at the Pulaski School at Gary, Ind. Here, children from kindergarten to high school age can be accommodated, each group in a portion of the ground designed and equipped for its particular requirements.

The athletic field finds its fullest use by junior high and senior high school boys and girls, and the demands of well-trained and enthusiastic players make a well-equipped field necessary. Although playgrounds for smaller children should be directly by a school, athletic fields may be, and in many cases are, secured away from the school. Sometimes difficulty in obtaining a large enough site determines this, or often a field is bought after the school has been built. There are some advantages in placing the athletic field several blocks away from the school building, the principal one being the absence of disturbing noise when the field is used by some of the children while others are still in the classrooms. The separation of the field from the school of course calls for a separate field house with provision for showers, dressing-rooms and lockers.

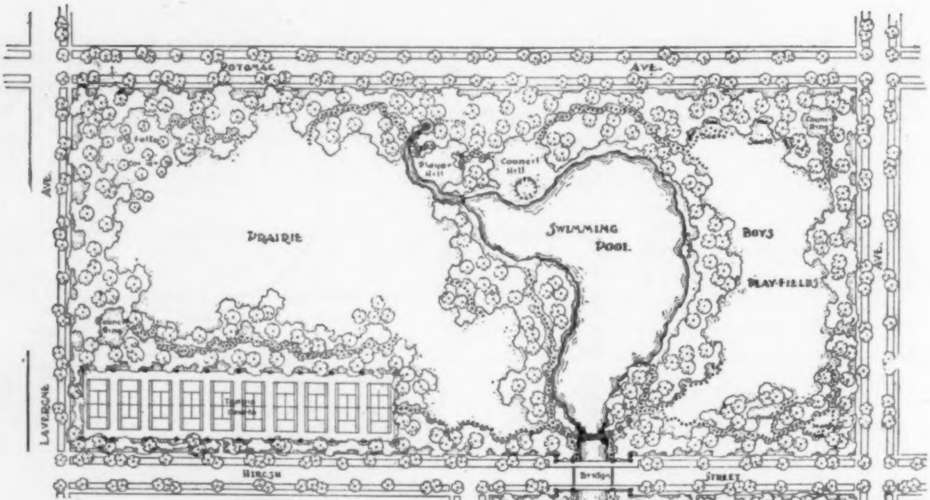
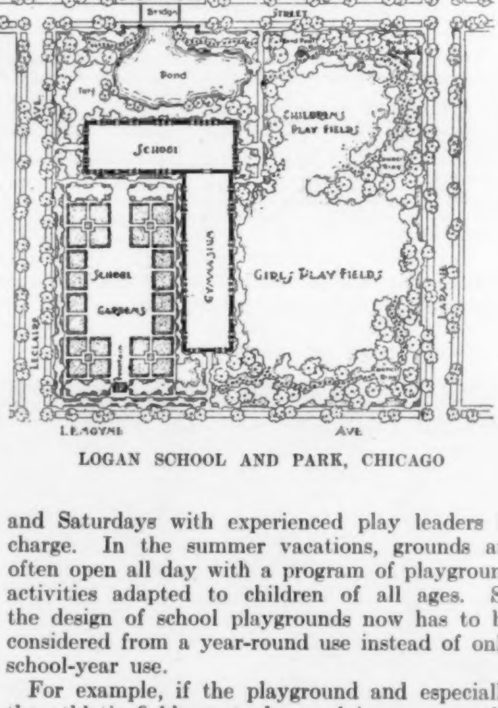


Courtesy of the Regional Plan of New York and Its Environs

PLAN SHOWING RELATION OF BUILDING TO SITE—THE MONROE HIGH SCHOOL, THE BRONX, NEW YORK CITY

Courtesy of the Playground and Recreation Association of America, Inc.

APPARATUS WELL ARRANGED IN SHADE OF TREES—NEWHALL SCHOOL PLAYGROUND, WALTHAM, MASS.

LOGAN SCHOOL AND PARK, CHICAGO

The School-Park-Playground Plan of Designing School Play Space

There is another method of designing school play space which has been tried in several cities and which has some great advantages. It is called the school-park-playground plan, and it has several interesting features. In a small community it is sometimes better to have a park playground and a school playground combined as one, especially if the park-like appearance can be retained. Logan School and Holstein Park in Chicago present an example of this combination of two municipal services. In East Cleveland, Pattison Park is being developed in an effective manner as a playground for Rozelle School. It is proposed to plant the school yard to fit into the landscape of the park. The plans call for a play field type of development with baseball diamonds, boys' playground, girls' playground, tennis courts, and a small open-air theater. There will also be a picnic grove with tables.

Large acreage in school sites naturally lends itself to landscaping and park-like treatment. A portion of the 29-acre site in Mason City, Iowa, has been made into a park on which all kinds of native trees and shrubbery have been planted. Other cities have some of their large school grounds planted for park purposes. This is a far cry from the bare, unsightly school yards of the past. For the problem of beautification of playgrounds is an important one, not only for the children who come under their influence, but also for neighborhood benefit. A recent study of playgrounds in and around New York showed that the land around those which were well kept and landscaped had increased in value much more than land around playgrounds which were bare of trees or grass.

School Playgrounds Designed for Year-Round Use

A modern school system has at least some playgrounds open after school hours on week days and Saturdays with experienced play leaders in charge. In the summer vacations, grounds are often open all day with a program of playground activities adapted to children of all ages. So the design of school playgrounds now has to be considered from a year-round use instead of only school-year use.

For example, if the playground and especially the athletic field are to be used in summer, the showers, lockers, toilets, etc., should be so arranged that access to the rest of the building is cut off if desired. Thus the late afternoon, evening and summer use of the playground together with the necessary indoor facilities is assured with the least interference with the building. As one might expect, the same facilities are used during the summer vacation if the grounds are open, as they should be to children of the neighborhood. Sometimes it is necessary to provide portable tents or shelters from the sun where there are not plenty of trees. Some summer playgrounds provide baby swings for the smaller children brought by their mothers.

The trend toward the community use of school playgrounds also means that there is considerable

use in summer by older boys and girls and adults. Twilight basketball and baseball leagues of working boys will use the playgrounds till dark. Night lighting of play areas can be successfully done and, although not necessary for the school program, might be considered important for working boys' athletics. Many recreation systems in large cities now provide for lighting certain areas such as basketball and tennis courts.

It is evident in looking over the field that the modern trend in public school playgrounds is toward much larger areas. Physical education programs, as now conducted in the schools, demand a more extensive and technically trained staff and also well-designed grounds for play and athletics in addition to the gymnasium with its more formal gymnastics. Not the least important feature is the after-school use of the playgrounds in winter and summer by the students and also by the young people and adults of the neighborhood. This use amply justifies the increased expenditures that progressive municipalities are making for the development of their physical education programs.

The Fencing of School Yards and Athletic Fields

By W. F. GOODNOUGH

WITH the rapid increase in density of automobile traffic, it has been found necessary to protect the playground areas of schools even in the smaller communities.

For the playground area at the grade school where the younger children must be protected against street accidents occurring through their thoughtlessness, it has been found that the modern chain link fence with tubular framework, either 4 or 5 feet high, is the best solution to this problem.

In this modern fence, all of the materials are galvanized by the hot dipping process, *after* fabrication, with a uniform coating of pure zinc, which protects them from rust or corrosion for a long period of years and at the same time overcomes the cost of upkeep for painting, which was formerly necessary. All posts in these fences are set in concrete footings which extend below the frost line and are domed above grade to shed water.

For exposed areas, or locations requiring fences over 5 feet in height, this same general type is available in still heavier materials, suitable for heights up to 10 feet. Fencing of this kind is today being manufactured by a number of reputable concerns which are qualified to take charge of the work of installation, as well as the furnishing of materials. Standardization has been carried to such an extent that a general specification may be written so that practically all of these manufacturers can bid to advantage on the work.

By adopting the use of these standardized materials, the school board is assured of competitive prices, prompt deliveries, and efficient services on the part of the successful bidder.

With the development of athletics, it has also been found both desirable and profitable to enclose the athletic field with a high non-climbable fence that will control entrance and egress at the gates, and that will fully protect the field when not in use.

For the athletic field, chain link fence in a standardized height of either 7 or 8 feet with an overhang at the top consisting of three courses of thick-set barbed wire is available, and has been found to answer the requirements better than any other type.

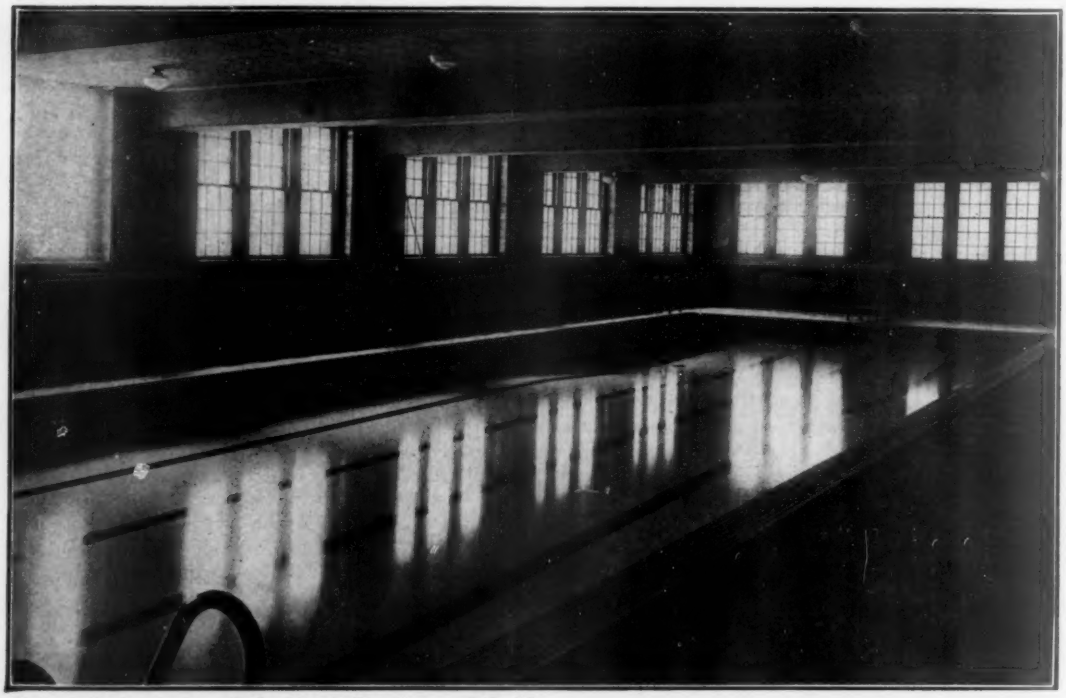
The chain link fabric is furnished in a 2-inch mesh and is available in two different weights of copper-bearing steel wire. No. 9, which is medium weight, is used in about 75 per cent of all installations; while No. 6, the extra-heavy weight, is used in some municipal installations where an unusual degree of strength is required. Gates of heavy construction are used in connection with these athletic field fences. The single gates are standardized for either 4- or 6-foot openings, while the double gates in standardized sizes up to 24 feet are readily available. These gates have locking devices arranged so that they may be reached from either side of the enclosure, and so that they lock the gates at top, middle and bottom, thus overcoming any chance that the gates may be sprung apart while the field is not in use.

Iron Picket Fence

For the main frontage of school grounds or the college campus, where dignified appearance is one of the main considerations, iron picket fence is generally used. The manufacturers have a few standardized designs which are readily available, and economical in price because of their standardized nature, but in the majority of cases, the iron picket fence is of more ornamental nature, especially designed for the purpose by the school architect.

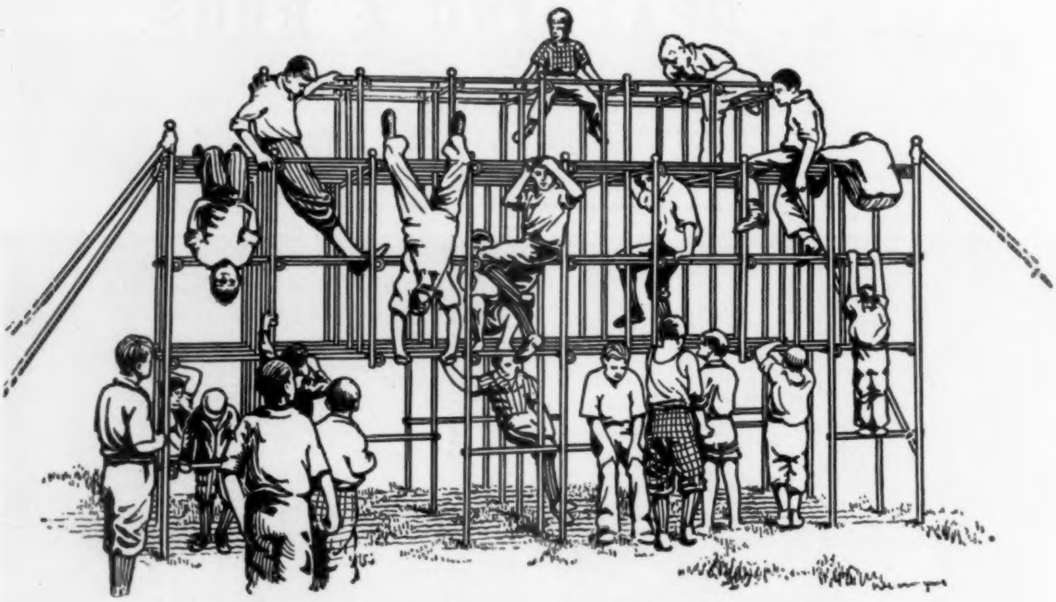
The Old and the New in Swimming Pool Design

AN OLD-TIME SWIMMING POOL LOCATED IN THE DETROIT CITY COLLEGE
Note the absence of natural lighting, the lack of a walkway around the pool and the improvised scum gutter



Photographs by courtesy of the Detroit Department of Health

A MODERN INDOOR SWIMMING POOL LOCATED IN CENTRAL HIGH SCHOOL, DETROIT, SHOWING THE TREND IN LIGHTING, HEATING AND DECORATION
Note the ceilings are soundproofed to prevent echoes



THIS IS JUNGLEGYM NO. 1—PRICE $320.00 F. O. B. FACTORY

JUNGLEGYM OWNERS TELL THE STORY

"Has never been an accident. **Think it the safest piece of apparatus made."**—Neva L. Boyd, Director, Hull House, Chicago.

"Retains its popularity after several years of use. **Would sooner part with all the rest of our playground apparatus than with Junglegym."**—C. W. Washburne, Supt. Public Schools, Winnetka, Illinois.

"Requires little supervision. Develops the children physically. **As much interest now as when first installed."**—James V. Mulholland, Supervisor of Recreation, Borough of Manhattan, N. Y.

"Children do not tire of Junglegym. Absolutely safe to play on."—J. S. Wright, Director of Physical Education, Chicago, Illinois.

"We recommend it heartily. **Entirely safe.** Interesting to the children."—Margaret F. Coe, Supervisor Intermediate Dept., The Park School, Baltimore, Md.

"Our little boys like the Junglegym as much as ever."—Edward E. Allen, Director, Perkins Institute for the Blind, Watertown, Mass.

JUNGLEGYM, JR.
SELECTED WOOD—$50.00
F. O. B. FACTORY

JUNGLEGYM, JR., NO. 5
GALVANIZED STEEL PIPE—$125.00
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From the very inception of the playground and recreation movement in the United States, Spalding has led in the development and manufacture of apparatus.

Spalding equipment is rugged. "Good enough" will not do—it must be of the highest quality.

Spalding equipment is carefully and scientifically designed. The various pieces are made to be just right for the children who are to use them. Sizes and spaces are correct, materials of full strength with a large factor of safety, design clean to avoid any danger from projecting pieces, bolts, nuts, etc.

PLANS

We offer, without charge or obligation, engineering service on designing complete recreation layouts. It is only necessary to give us all facts available, sketch of grounds with dimensions, and if possible, the topography contours.

PRICES

We are prepared to figure on supplying and installing the complete equipment of apparatus including pipe frames.

If preferred, we will quote on all apparatus and frame fitting of design f. o. b. factory or freight paid to destination. In such case we will supply all necessary erection instructions and blue prints, also complete specifications of galvanized pipe required to construct frames so that you can obtain the correct type and sizes of pipe from local supply houses.

GENERAL OBSERVATIONS

Playgrounds should be placed at points convenient to the children, as, for instance, near to the schoolhouses, assuming that they are properly placed to serve the people most conveniently. Experience has shown that children will not, in any number, travel more than a quarter of a mile to a playground.

Boys and girls should have separate spaces. Fences should be used, one gate entrance to each, to give the director full control. Playgrounds of all kinds should have a trained play teacher in charge, not a policeman or janitor.

The smaller children under ten can usually be counted on to play in one corner of the girls' space. Usually an older sister has them in charge. Also the type of play and games conducted by the girls is safer for the little ones. In this corner we should have a sand pit and a shallow wading pool.

Sanitary bubble drinking fountains should be provided in each of the spaces.

Comparatively few playgrounds are properly shaded. **Trees are absolutely needed** in the hot days of summer if the playground is to be used. A bare, hot playground is about the most unattractive spot in the city.

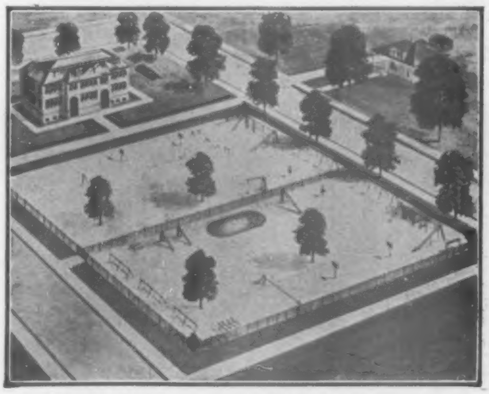
We show here by way of illustration a suggestion for a neighborhood playground embodying some of the special desirable features mentioned.

Observe the low fence around swing frames. This will serve greatly to prevent accidents to children from running heedlessly into the flying swings.

We shall be pleased to correspond with you in regard to any recreation plans or developments.

Service Bulletins giving special information on any detail of recreation promotion or facilities, standard or typical plans in blue-print form of athletic fields, baseball diamonds, football, soccer, basket-ball, tennis courts, or special layout plans of equipment for your playgrounds or gymnasium, will be sent on request.

Catalogs sent on request.



SUGGESTION FOR A NEIGHBORHOOD PLAYGROUND ADJOINING PUBLIC SCHOOL

Just as health authorities have found that municipal drinking water must not only be filtered but must also be **sterilized,** so, in the case of swimming pool purification the water must be sterilized. There is no possibility of disease being transmitted by a **sterilized** swimming pool water. Filtration alone **cannot** give a sterile water,—and so today we find that swimming pool sterilization is a standard requirement contained in all health regulations pertaining to swimming pool sanitation.

CHLORINATION THE BEST METHOD OF SWIMMING POOL STERILIZATION

"From all available information the addition of chlorine . . . by the use of proper apparatus, is today the most satisfactory method of pool disinfection"—so states the report of the Joint Committee of State Sanitary Engineers and American Public Health Association after five years' careful study.—And the report goes on to tell why —because of the residual sterilizing action of chlorine.

Higher endorsement could not be had.

This endorsement is because chlorination —and chlorination alone—provides **continuous** sterilization throughout the entire pool. Bear in mind that the filtered, sterilized water, the moment it enters the pool and comes in contact with a bather, is again liable to pollution which will carry through the pool, increasing as the water nears the outlet. Some means must be provided to destroy this pollution and prevent the possibility of it spreading disease during its travel through the pool.

This is accomplished by chlorination.

A properly operated pool will have in the pool water at all times just sufficient residual chlorine to destroy the microbes of disease. There is not enough to be noticed —the most sensitive bather cannot detect it. But there **is** enough there to kill a germ that is washed from the body or mouth rinsings of one bather **before** that germ can come in contact with another bather!

Convenient, simple apparatus is furnished for testing the pool water to determine the amount of residual chlorine.

Twenty-eight indoor swimming pools were recently examined by the Detroit Health Department. Three of them contained water purer than required by the United States Public Health Service for drinking water.

And **each** of these three chlorinated the water!

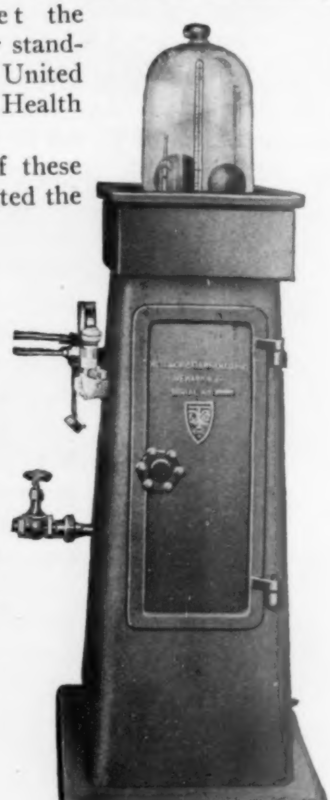
The pools were ranked in accordance with their purity.

Each of the first **ten** pools chlorinated!

Seventy-five indoor swimming pools were recently examined by the New Jersey State Department of Health. **FIVE** of them were found to contain water sufficiently pure to meet the drinking-water standards of the United States Public Health Service.

And **each** of these FIVE chlorinated the water!

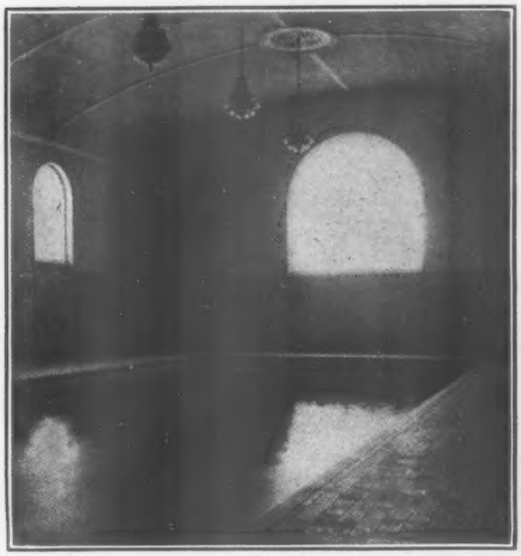
The vacuum principle of control is exclusive with W. & T. Chlorinators. The operation is completely visible. Chlorine comes in contact only with silver, glass and rubber. The first Vacuum Chlorinator was shipped in 1921. It is still operating and so are all of the other two thousand shipped since then. Long life is characteristic of W. & T. equipment.



W. & T. VACUUM SOLUTION FEED CHLORINATOR TYPE MSV FOR THE VERY LARGE POOL

That is why health officials everywhere endorse chlorination.

And just as chlorination is the accepted and preferred method of swimming pool sterilization, so is Liquid Chlorine and W. & T. apparatus the preferred method of chlorination. That is because liquid chlorine is easily handled, always full strength, universally available, while the W. & T. sterilizer for controlling the application of the liquid chlorine is automatic, fool-proof, simple, durable. Once placed in operation, it stays in operation.



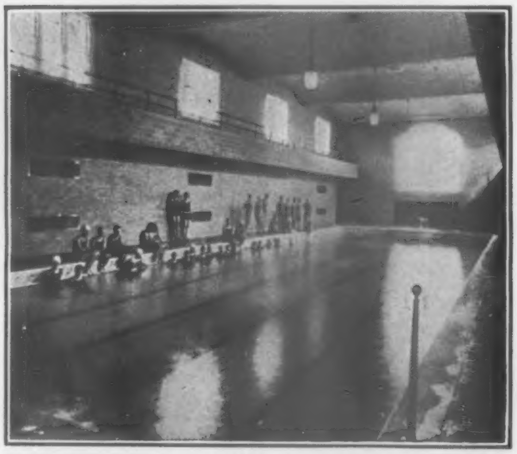
W. & T. EQUIPMENT STERILIZES THE SWIMMING WATER AT DARTMOUTH COLLEGE

Liquid chlorine and W. & T. swimming pool sterilizers remove the guesswork from swimming pool sanitation.

The sterilization of water by liquid chlorine and W. & T. equipment is thoroughly established. There are nearly 7,000 installations of W. & T. apparatus, sterilizing upwards of five thousand million gallons of drinking water each day. Every drop of drinking water delivered to over 3,000 communities in North America is sterilized with liquid chlorine. These public water supplies through chlorination meet the requirements of the United States Public Health Service for drinking water—while in just the same manner, in close to a thousand swimming pools protected by W. & T. sterilizers, the bathers are swimming in water fit to drink.

The almost universal use of W. & T. apparatus and liquid chlorine to sterilize public water supplies and swimming pool water has brought about Wallace & Tiernan's country-wide organization of trained public health engineers, each thoroughly conversant with all problems of water purification and each available to coöperate without charge with architects, engineers and owners interested in swimming pool sanitation.

Hundreds of the leading Schools and Universities in North America are using W. & T. swimming pool sterilizers.



THE SWIMMING POOL AT COLUMBIA HIGH SCHOOL, SOUTH ORANGE, MAPLEWOOD, NEW JERSEY, IS EQUIPPED WITH A W. & T. STERILIZER

Wallace & Tiernan manufacture a complete line of Swimming Pool and Water Supply Sterilizing Equipment. We will be glad to send detailed information to any address upon request.

MILLERSVILLE SUPPLY COMPANY

Manufacturers of

Benches, Swings and Portable Bleachers

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Trade Name—
"BAUSMAN BETTER BENCHES"

HISTORY

"Bausman Better Benches" and Swings have been manufactured and used for more than a quarter of a century, in which time we have developed a line of the most practical designs and have kept absolute faith with our customers. Our motto has always been, "The customer must be satisfied."

This line comprises nine designs of benches—each one differing from the other in style, but each one tried and found especially serviceable—also the New Heavy Park Swing.

Schools and Universities everywhere are finding benches and swings a means not only of beautifying their campus but also of making the campus more attractive and inviting to the students.

In gymnasiums where a balcony or gallery is present, our benches can be furnished in special lengths and "tailored" to fit, providing long, continuous, comfortable seats which will accommodate a maximum crowd. More schools are finding this a means of providing better and more comfortable seats at a great saving in cost. The seats for each installation are made up from specifications and floor plans, insuring the use of all available space for seating and providing ample room for passage between rows.

CONSTRUCTION

All "Bausman Better Benches" are attractive, comfortable and durable. They are made in three standard lengths—four, five and six feet; also special lengths to order.

All frames are hand-wrought steel. All wood parts are made from selected hard wood, thoroughly air-dried and seasoned.

All metal parts are finished with green enamel, and the wood parts with weatherproof varnish or green enamel, if desired.

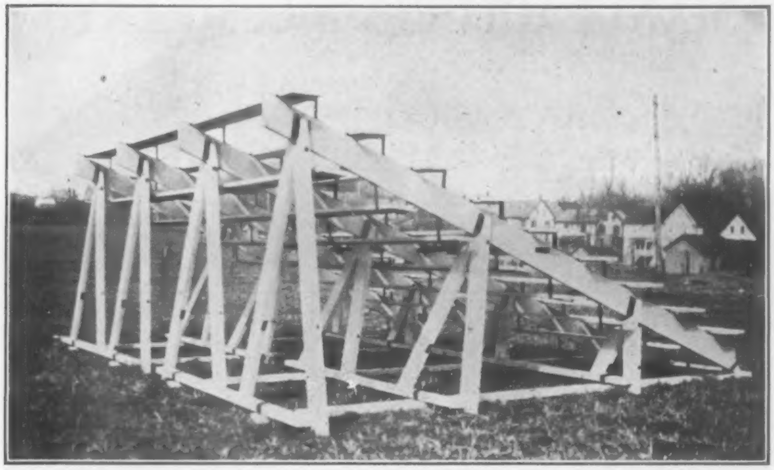
THE "COMMONWEALTH" BENCH

This is but one of our nine designs of benches, but the most popular for use on the campus owing to its comfort. Notice the full-shaped seat and back, insuring comfort to those who use it, whether for studying, reading or relaxing.

THE "COMMONWEALTH" BENCH

THE NEW HEAVY PARK SWING

This swing has become very popular and, owing to its heavy construction, is a very practical piece of equipment giving many years of service. The frame is made of $1\frac{1}{2}'' \times 1\frac{1}{2}'' \times \frac{3}{16}''$ steel angles and the whole swing, weighing 250 pounds, is shipped in three parts which are very easy to assemble.



Note the strong braces and the unique manner in which each section is put together. Parts may be stored in a comparatively small space.

PORTABLE BLEACHERS

This is a comparatively new item which has been added to our line only after several years of experimenting to prove that we were able to offer the most practical form of seating arrangement for indoor and outdoor use.

The bleachers can be erected and torn down by the most inexperienced persons for there are no screws nor bolts to be used and each part fits in its place. They can be moved to any place where a crowd must be accommodated—indoors or outside—and when it is desired to store them away, they can be placed in a comparatively small space.

In addition to all this, they provide the greatest comfort to the spectators in the minimum space. The pitch of the seats gives every spectator a clear view and the footroom underneath the seat ahead avoids soiling the clothes of the persons seated in front.

They are safe—every feature in the construction of our bleachers is designed for safety. We use only fir for making the wood parts—insuring the greatest strength and the longest life—and all metal parts are handwrought steel.

They are furnished in sections of from two tiers to ten tiers in height, each tier seating ten to eleven persons. Each section is sixteen feet long, but where sections adjoin to make a continuous stretch of seats, each additional section after the first adds fifteen feet on account of overlapping of boards.

All wood parts are painted grey, and all metal parts black.

COMMUNICATIONS

All communications should be addressed to our office at Millersville, Pa.

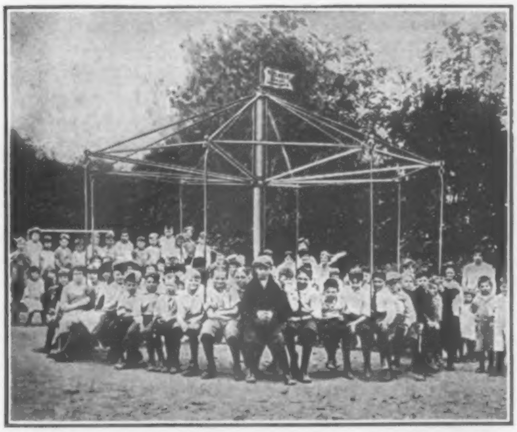
Any person can assemble these bleachers in no time at all. Each part easily fitted in place. No bolts, screws or nuts are used.

PARK PLAYGROUND, MILWAUKEE, WIS.

MITCHELL WHIRL

The MITCHELL WHIRL is one of the most popular pieces of playground apparatus on the market. It is especially desirable because of its elements of safety and its exceptional facilities for producing healthful and invigorating exercise for the children. It is strongly built, very attractive and so designed as to consume only a very small area of space.

One of its main features is that it has a capacity of fifty children. This makes it the least expensive piece of playground apparatus per child that could possibly be placed on any playground. Because of its indestructible bearing members, the Mitchell Whirl can be easily operated by a single child. The platform or endless seat revolves around a staunch steel mast and can be simultaneously swayed to and from the mast. The seat remains at all times parallel to the ground, and eliminates the dip motion.



50 CHILDREN ENJOYING THE MITCHELL WHIRL

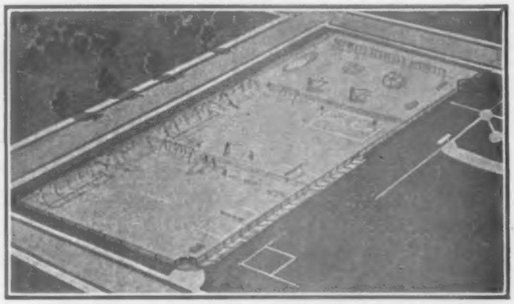
CATALOG AND SERVICE

Everyone interested in playground work should have a copy of the Mitchell "Betterbilt" catalog. With each catalog is offered Mitchell Service, a service which closely co-operates with you and assists you in handling your playground problem satisfactorily and economically. Our engineers advise on the basis of past experience, and the service places no one under any obligation.

OUR GUARANTEE

We have been engaged in the manufacture of various kinds of equipment for more than thirty years and we stand behind each and every article we produce. Our guarantee which accompanies each article is backed by the confidence earned through many years of honest, square dealing. We guarantee that the apparatus shown in our catalog is exactly as illustrated and described. If for any reason the goods are not satisfactory, they can be returned to us at our expense and either exchanged for something else or the money refunded.

Be sure to write for our catalog, which fully describes "Betterbilt" playground apparatus.



SUGGESTED COMMUNITY PLAYGROUND

NARRAGANSETT MACHINE COMPANY

Manufacturers of

GYMNASIUM APPARATUS, STEEL LOCKERS, SHELVING,
STORAGE CABINETS, PLAYGROUND APPARATUS

General Office and Works:
Pawtucket, R. I.

Mailing Address:
P. O. Box 1454, Providence, R. I.

Branch Offices:

New York, 214 East 40th Street

Chicago, 1504 Monadnock Block

GYMNASIUM APPARATUS

For more than 45 years Narragansett Gymnasium Apparatus has faithfully served Physical Education in schools, colleges, and institutions. What probably is the largest reserve gymnasium apparatus stock in the country is maintained in the store room to supply your requirements. Much of the equipment must be made special to fit your particular gymnasium. Our policy has always been to serve the institution direct, thus giving factory service where the various engineering details are involved. Our engineering department will gladly make recommendations as to the best type of apparatus for your definite problems.

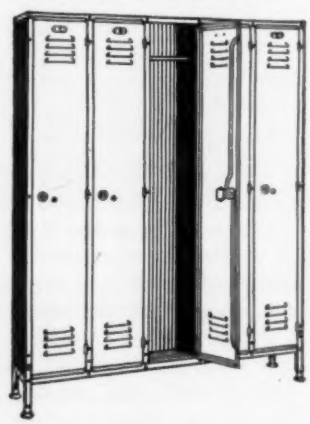
GYMNASIUM CATALOG F

The Narragansett Gymnasium Catalog fully illustrated is used as a standard for specifications. Bound in the latter half of the catalog is our Manual of Gymnasium Construction. This is also furnished in monograph form for architects and building committees. Full detailed information is given regarding the gymnasium building, particularly the preparation of walls and ceiling for attached apparatus.

ANTHROPOMETRIC APPARATUS

We manufacture anthropometric apparatus that is used by physicians and physical directors for ascertaining the physical measurements of the individuals. A large stock is kept on hand for prompt shipment.

STEEL LOCKERS



As one of the pioneers in steel locker manufacture, the Narragansett Standard Lockers have given satisfaction as to service, attractiveness, and durability. They are made in a variety of sizes and combinations. Prompt shipment is made from stock. Full information is given in Catalog G.

STEEL SHELVING AND STORAGE CABINETS

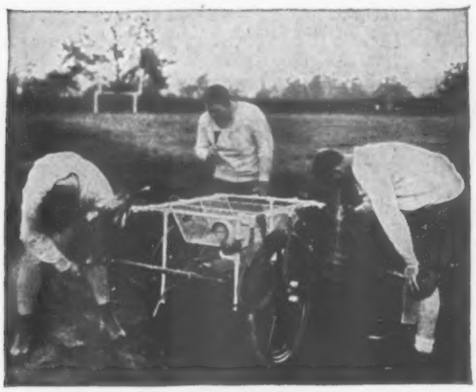
For offices, stock rooms, laundries, sewing rooms, and check rooms Narragansett Adjustable Steel shelving is economical, fire-resisting, and durable. Estimates are furnished. Ask for Shelving Folder.

Steel Storage Cabinets for office supplies, books, tools, records, etc., can be furnished in various sizes from stock. Attractive factory prices are given in the Cabinet Folder.

PLAYGROUND APPARATUS

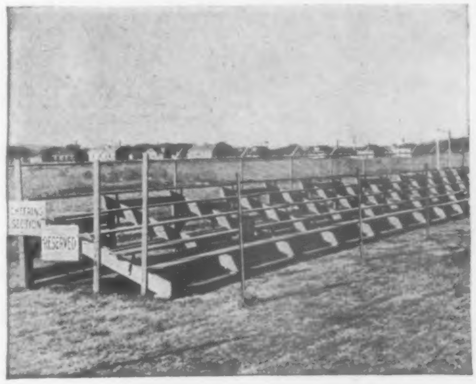
Narragansett Playground Apparatus is designed for safety, sturdiness, and long life. Swings, seesaws, slides, giant strides, etc., are shown in the Playground Catalog D.

THE NARRAGANSETT WATER WAGON



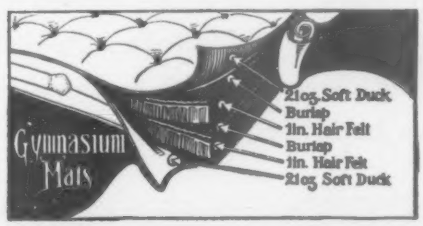
A self-contained sanitary multiple drinking fountain and pressure spray that receives the enthusiastic endorsement of such institutions as West Point, Stanford University and others. Introduces a new era in athletic hygiene. Sturdily constructed and built to last many seasons. A large supply tank with tray for icing. Eight separate connections of flexible hose are topped by faucets controlled by spring valves. Pressure is regulated by hand and furnishes a gentle trickle or powerful spray. Of inestimable value as a "freshener" just when it's needed. A strong wire basket at top provides ample space for towels, trainers' or physicians' first aid kit. A strong hand pump keeps pressure at desired intensity between periods of use. Entire machine is mounted upon a heavy axle. Wheels are pneumatic-tired. **Write for literature.**

NARRAGANSETT PORTABLE BLEACHERS

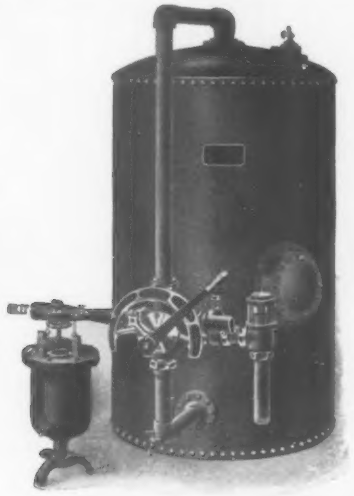


A distinct step forward in simplicity without sacrificing strength. Few parts make for ease of erection. No loose nuts, bolts or screws. No small parts to be lost and no tools necessary for erection. Requires a minimum of space for storage. Thoroughly tested and possesses a factor of safety far beyond ordinary needs. Supplied in three, four, five, six, seven or eight tiers. All wood is smooth-planed and nicely painted. This is the type of equipment for all occasions—football, basketball, baseball, gym meets, swimming meets, tennis matches, track meets, etc. One or two events will often pay the entire cost. **Send for detailed literature.**

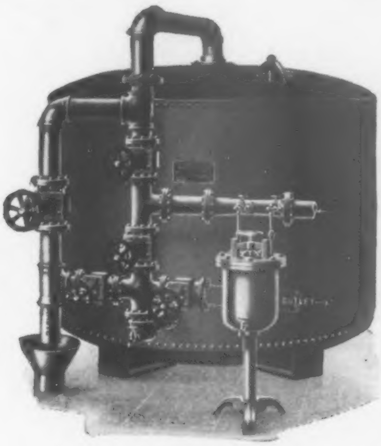
NARRAGANSETT GYM MATS



A close study of the accompanying illustration will reveal the secret of the overwhelming popularity of Narragansett Gymnasium Mats. Here is an item of equipment that merits keen judgment in purchasing. Its vital importance not only in use but in "long wearability" demands quality materials and workmanship throughout. Narragansett Gymnasium Mats were built first and priced afterwards. Many have been in use for more than 20 years. They afford a maximum of protection. They will hardly show the first signs of wear when cheaper substitutes have long been discarded. Their cost will be far less when long service is considered. **Send for literature.**



STYLE "G"



STYLE "L"

COOPERATION

Our Engineering Department is at the service of Architects and Engineers engaged in the design, construction or maintenance of swimming pools. We welcome every opportunity of cooperation. Our new Swimming Pool Catalog mentioned before contains complete data on the sanitation of swimming pools.

EQUIPMENT

All filters are fully equipped and before shipment are assembled and carefully tested. With each installation we include an automatic coagulant device.

Cleaning of Roberts Filters is thoroughly and easily accomplished by reversing the flow of water, which lifts and "liquefies" the sand bed, scouring it on itself and flushing the accumulated suspended matter and impurities to the sewer.

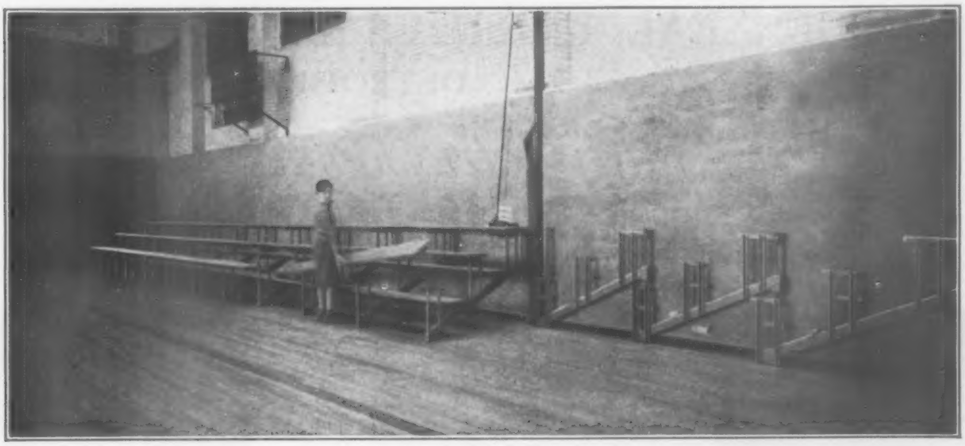
SPECIFICATIONS

Specification data on all types of Roberts Filters in bulletin form will be sent on application. Our styles "H," "G," "L" and horizontal pressure filters are recommended for swimming pool recirculation.

ACCESSORIES

We manufacture pool fittings, haircatchers and other accessories which will be supplied separate from filters and other recirculating equipment when specified or so ordered.

ALMA COLLEGE, ST. THOMAS, ONTARIO, CANADA



WAYNE "D" TYPE FOLDING WALL STAND. AN IDEAL ARRANGEMENT FOR GYMNASIUMS

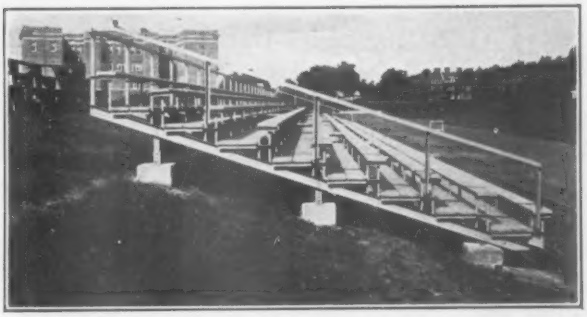
hazard reduced to minimum. Endorsed by casualty insurance companies.

The Type "C" Portable Steel Stand is designed for limited areas and is made from three to eight rows high. Additions can always be made to length. Its essential design same as Type "B." Used indoors and outdoors. Especially suitable for gymnasiums, swimming pools, etc.

Type "D" Stand is a specially designed wall stand that meets the needs of many schools. The steel stringers are hinged to the wall and when not in use swing flat.

In all the above type stands the seats and footboards join flush. Seatboards are securely locked to supports and cannot accidentally be removed. Footboards are wide and it is impossible to slip down between rows.

WAYNE PERMANENT STAND, UNIVERSITY OF MARYLAND



WAYNE PERMANENT STEEL STAND REPLACES WOODEN STAND AT PEDDIE SCHOOL

Wayne also makes Permanent Steel Grandstands and the massive stand at the University of Maryland is a striking example of Wayne's engineering skill.

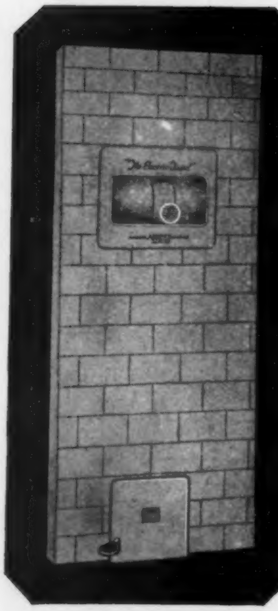
Full information on your seating requirements will be cheerfully supplied on request.

GENERAL UTILITIES MFG., CO.

2587 E. Grand Blvd., DETROIT, MICH.

"The Electric Towel"

MODERN — SILENT — SANITARY



BUILT-IN WALL TYPE

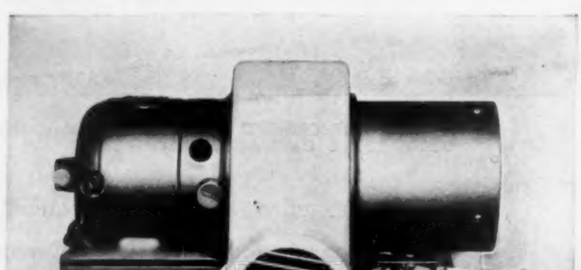
Modern schools, playgrounds and swimming pools have adopted the "Electric Towel" as the new, sanitary method of drying the hands and face.

The improved "Electric Towel," a development of ten years by the originators of electric hand drying, is now offered in new and attractive models for the consideration of school principals and superintendents, playground commissioners and architects who desire the last word in safe, sanitary and efficient washroom equipment.

STANDARD PEDESTAL TYPE

STANDARD PEDESTAL TYPE

This model of the "Electric Towel" is the one most generally used in schools, playgrounds and bathhouses where the character of construction does not lend itself easily to the "recessed wall type." It is made of pressed steel and is finished in pure white porcelain enamel, giving it a handsome, clean appearance that harmonizes well with the other sanitary fixtures of a well-ordered lavatory or wash room. The adjustable nozzle may be moved up or down as required in order to deliver its stream of clean, electrically heated air either to the hands or face. The operation is controlled by a foot pedal, placed so as to provide maximum of ease to the user.



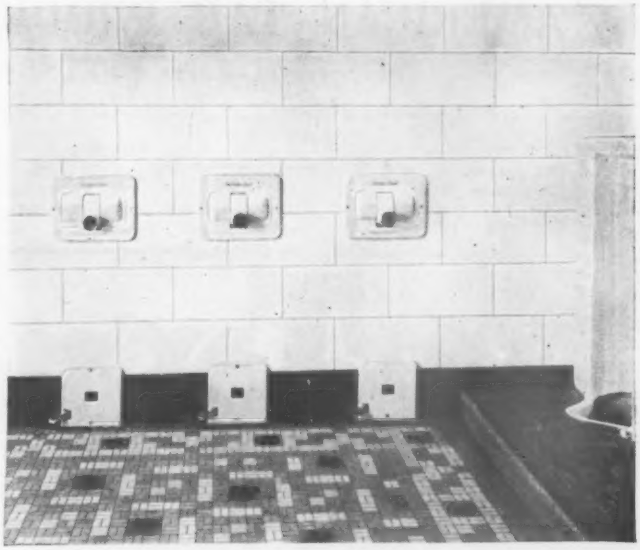
THE LONG LIVED, NOISELESS ELECTRIC MOTOR DEVELOPED BY THE GENERAL ELECTRIC COMPANY FOR USE EXCLUSIVELY IN THE "ELECTRIC TOWEL"

NOISELESS, IMPROVED MOTOR

The new "Electric Towel" is made in two types—the Standard Pedestal and the Recessed Wall Type—and is equipped with an especially designed General Electric motor. The results of continuous improvements by General Electric engineers have so perfected the "Electric Towel" motor that except for the sensation of clean, warm air being blown against the skin, the user is scarcely aware of its mechanical action. It operates quietly and quickly with no noise and no vibration, yet it will thoroughly dry the hands in 36 seconds.

THE RECESSED WALL TYPE

The built-in model "Electric Towel," also with adjustable nozzle and foot pedal control, is now specified by leading architects throughout the country on up-to-date gymnasium, playground and swimming-pool wash rooms. The constant improvement of the "Electric Towel" G. E. motor over a period of ten years makes it absolutely free from vibration, so that it is now practical to install it in the wall. Contrast the appearance of a wash room equipped with unsightly cabinets for paper towels or racks for cloth towels with one equipped with the "Electric Towel" recessed in the wall and harmonizing perfectly with the snow white wall and other fixtures.



MODERN LAVATORY "ELECTRIC TOWEL" EQUIPPED

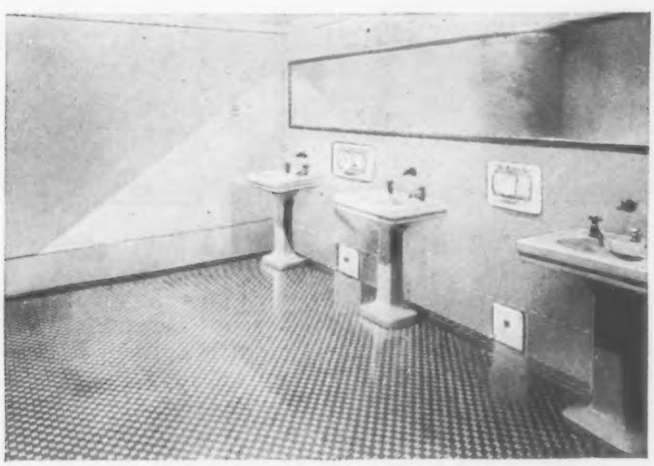
CUT COST 60% TO 80%

The economy of the "Electric Towel" as compared with cloth or paper towels, and the atmosphere of cleanliness and good order that it imparts to the wash room are factors which make it a popular addition to the school and playground wash room.

Actual savings effected by the use of the "Electric Towel" are from sixty to eighty per cent. With this machine janitor service in the wash room may be dispensed with because there are no unsightly litters of discarded cloth or paper towels to be gathered up or swept out.

Investigation of the comparative costs of drying service shows that one thousand "dries" with the "Electric Towel" cost 30c. as compared with $5.00 for cloth towels and $3.35 for paper.

The General Utilities Mfg., Co. will be glad to assist your community in planning the most effective use of "The Electric Towel" for your school, playground or swimming-pool wash room.



WASH ROOM EQUIPPED WITH RECESSED WALL TYPE

Write for illustrated booklet and print showing suggested installation of "Recessed Wall Type."

CARTER BLOXONEND FLOORING CO.

902 Walnut Street, KANSAS CITY, MO.

BRANCH OFFICES IN LEADING CITIES

Manufacturers of

BLOX-ON-END FLOORING *Lays Smooth Stays Smooth*

BLOXONEND IS A COMPOSITE END-GRAIN FLOOR LAID IN 8 FT. STRIPS AND SPLINED TOGETHER

FOR GYMNASIUMS

YOUNG JR. HIGH SCHOOL, NEW ROCHELLE, N. Y.
Starrett & Van Vleck, Architects, New York City

The extensive use of the gymnasium in the modern school has made necessary the use of a flooring that embodies greater stamina than is possessed by the old-fashioned type of flooring.

This factor plus the demand for a safe, splinter-proof floor has resulted in BLOXONEND being widely used in finer type schools. It is specified by nearly all prominent school architects.

NO SLIVERS POSSIBLE

The tough end grain forms the wearing surface of BLOXONEND, eliminating the sliver hazard and insuring long life. The floor is handsome, fast, quiet, stays smooth and affords utmost resiliency. It provides the ideal surface for basket-ball, free rhythms, calisthenics, dancing and other activities for which the modern gym is utilized.

FOR SCHOOL SHOPS

WEBSTER JR. HIGH SCHOOL, QUINCY, MASS.
BLOXONEND IN SHOPS AND GYMNASIUM
Wm. Chapman, Architect

It has been the experience of leading industrials that cold, stone-hard floors are conducive to poor work because they put a brake on both mind and body. School architects and prominent educators, being of the same opinion, seldom tolerate such floors in shop rooms.

Wood is the preferred flooring material and the trend is toward the use of BLOXONEND because of its long life, resiliency, smoothness and cleanliness. This floor is non-sliver and naturally non-slip. It prevents damage to tools accidentally dropped.

WRITE FOR BOOKLET

Our Booklet "School Floors" gives details of construction, contains specifications for laying and illustrates representative installations in gyms and shops. Write for a copy.

CHICAGO HARDWARE FOUNDRY CO.

Electrical Division — Department 292

NORTH CHICAGO, ILLINOIS

BRANCH OFFICES IN PRINCIPAL CITIES OF UNITED STATES AND CANADA

Speedy Hair Driers for Swimming Pools

AND

Hands and Face Driers for Lavoratories

Sani-Dri

SPEEDY "SANI-DRI" HAIR DRIER

The ideal equipment for the busy swimming pool or shower room. Strongly built, with an outer construction of high grade cast iron and genuine porcelain enamel that is easily cleaned and will last a lifetime. The handy swivel nozzle can be used at any angle. Sani-Dri is easily attached to the wall and easily connected to your regular wiring system. Operated by a quiet, efficient electric motor.

CROWDS MOVE QUICKER BECAUSE "SANI-DRI" DRYS FASTER

This Sani-Dri Hair Drier is not only fast, but thorough. Its quick stream of warm air penetrates through the hair to the scalp and everybody gets a real dry—in one-third the ordinary time. Sani-Dri is equal to three outlets of the old-style blower type. It is easily operated and consumes only 50% of the usual drier current. That's economy, plus efficiency. Send for fully descriptive folder.

THE NEW "SF" SANI-DRI FOR HANDS AND FACE

solves the problem of washroom sanitation permanently for School and University. Sani-Dri eliminates the muss, fuss and litter of old, unsightly towels forever. Once installed, it operates continuously, reduces janitor service and completely avoids those "no towel" periods when daily or season's needs are underestimated.

FASTER, QUIETER, MORE EFFICIENT

Sani-Dri "Dries Quicker Than a Towel" and dries more thoroughly, too—the healthful, natural way, by evaporation. This new "SF" model has twelve new improvements which are real advantages in the school. It has a new "all-position" swivel nozzle, which allows the small child or tall adult to dry the face, hands or neck comfortably, while standing in a natural position. Best of all, it has a fully protected, mischief-proof construction. Made of highest grade grey cast-iron and covered with genuine porcelain enamel. A new booklet, "12 Points of Perfection" details all the new improvements. Send for it.

DETROIT-ATLAS PORTABLE BLEACHER SEAT COMPANY

520 Free Press Bldg.

DETROIT, MICHIGAN

SEATING FOR SPECTATORS IN GYMNASIUMS, ATHLETIC FIELDS, ETC.

In selecting Bleacher Seats, the most important features to be considered are:

Safety, Strength, Durability, Appearance, Comfort, Ease of Handling, Minimum Space in Transporting and Storing, Lowest Average Yearly Cost—No Up-Keep.

The combination of all of the above vital points is exclusive with the DETROIT-ATLAS.

SPECIFICATIONS

Assembly—Each full sixteen-foot section a complete independent unit, supported on FOUR jack-and-stringer assemblies. No overlapping of seat and footboards.

Jacks—2 x 4 long leaf yellow pine, securely bolted through the top and connected NEAR THE BOTTOM by a heavy iron bar bolted through.

Stringers—2 x 8 long leaf yellow pine, to which are attached

Iron Supports for Seat and Foot Boards—being **MALLEABLE CASTINGS** which straddle the stringer, attached by bolts which pass through the stringer and both jaws of the castings.

Steel Locking Device—Consists of 1¼ x 1¼ angle steel thrust rod, to which are riveted malleable hooks, locking all jacks to nose of stringer.

Seat Boards—1¼ x 10 Oregon Fir—without a knot—rounded edges.

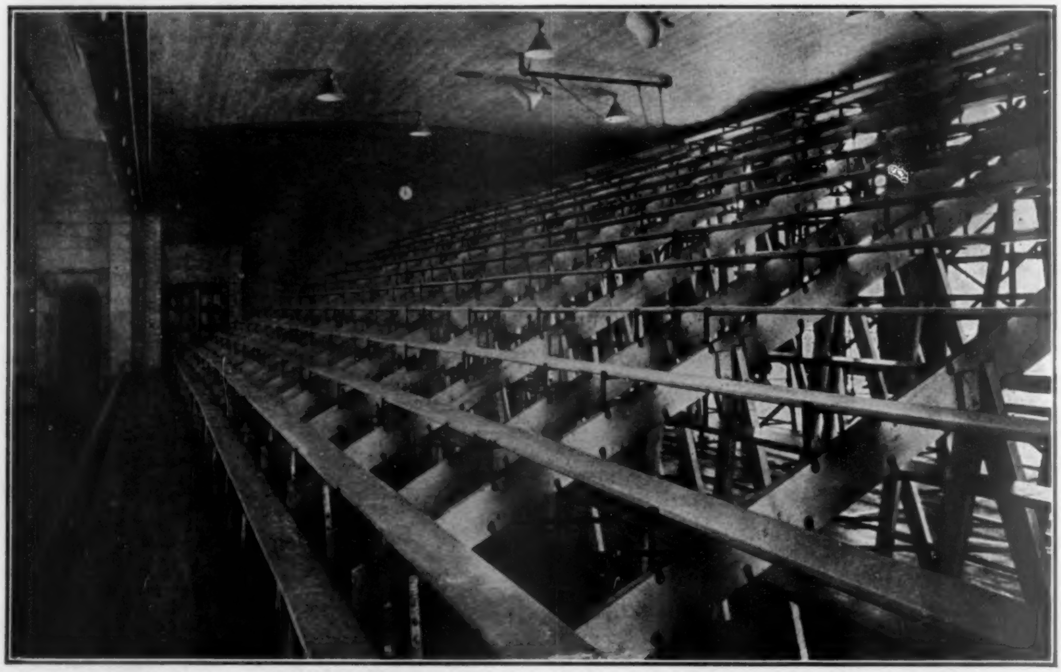
Foot Boards—1¼ x 8 Oregon Fir—without a knot—rounded edges.

Nose Rest—2 x 8 long leaf yellow pine.

Painting—All wood parts painted with best quality gray floor paint. All castings and steel black enamel.

Non-Split Corrugated Steel—Driven into ends of seat and foot boards.

Elevation—Seats spaced 22 inches on stringers with 7½-inch rise; or, 24 inches on stringers with 12-inch rise.



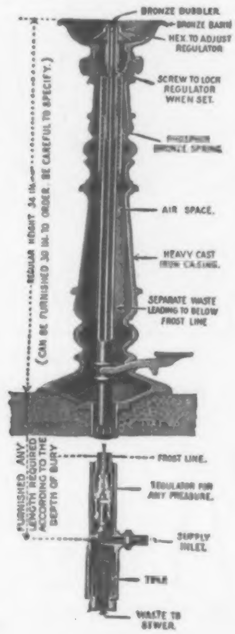
DETROIT-ATLAS SEATS OVERLOOKING THE POOL IN THE WORLD'S MOST BEAUTIFUL INTRAMURAL SPORTS BUILDING, UNIVERSITY OF MICHIGAN

THE MURDOCK MFG. & SUPPLY CO.

426–430 Plum Street, CINCINNATI, OHIO

MURDOCK OUTDOOR BUBBLE FONT FOR SCHOOL YARDS

USED IN 593 CITIES AND TOWNS



DISTINCTIVE FEATURES

Anti-freezing — Valve below frost line.

Self-draining — Every drink is fresh from the water main.

Inner Works—All brass—prevents rust and insures clean, wholesome water at all times. Inner works can be removed without digging up the fountain.

Non-squirting—When properly regulated the fountain delivers a full soft bubble, a squirting stream is impossible. Children cannot squirt with it.

Bowl and Bubbler Head—Solid Bronze, beautifully chromium plated giving a lasting bright and attractive finish.

Pedal Action—Best because of ease and convenience of operation for small children. Infinitely stronger than any hand operated valve.

Fool Proof—Supply tube, waste tube and valve are completely enclosed—out of harm's way.

Trouble Proof—Gives uninterrupted service over a long period of years.

Standard Height—34 inches but can be supplied in 30 inch height.

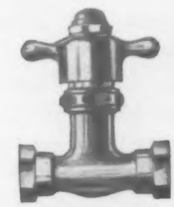
Can be supplied in any depth of bury beginning at 12 inches. Depth of bury is the dimension from top of ground to center of supply inlet.

ALL-CAST BRASS WALL FOUNTAINS

"HERCULES"
Vertical Bubbler

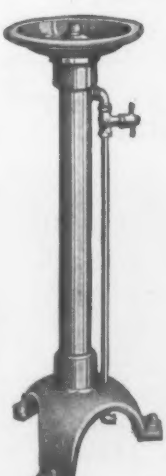
"MUR-MADE"
Angle Stream

"SIMP-SAN"
Bubbler Head



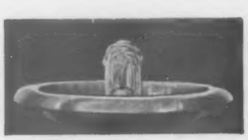
"SAMPSON"
Self-closing Stop-cock

"SANDOW" SELF-CLOSING PEDESTAL FOUNTAIN



Solid Bronze Bowl and Bubbler — nickle plated. Heavy Cast - Iron Base. Wrought Iron Standard. Positive Closing Cock.

A very substantial fountain for hard service.



This vertical type of Bubbler can be supplied if desired on the MURDOCK "Outdoor Bubble Font" and the "Sandow" Fountain.

NEWARK STEEL POST COMPANY

WEST ORANGE, NEW JERSEY

PRODUCTS

Steel equipment for school grounds and playgrounds, including "RE-MOVE-ABLE" Steel Flag Poles, "SAFE-PLAY" Playground Swings and Horizontal Ladders.

"RE-MOVE-ABLE" STEEL FLAG POLES

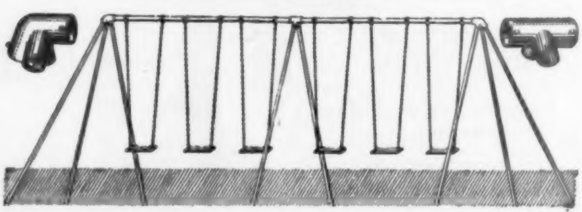
The poles are made of galvanized high-carbon steel tubing and are painted with aluminum or white over the galvanized surface giving a lifetime protection to the pole. Ground poles are furnished in sizes from 15 to 80 feet. No special skill is required to set the socket, put the sections together, and erect the pole. The sections telescope into each other, thus assuring double-strength at the joints. This being preferable to using reducing sockets, as cutting the threads often weaken the joints.

THE "SAFE-PLAY" SWING

This is a miniature gymnasium as well as a swing. There are, besides the two swings, a trapeze and a pair of rings, all of which are interchangeable. The uprights and the horizontal bar are made of steel tubing. This outfit is built throughout to stand all kinds of abuse and will last for years in your playground or park.

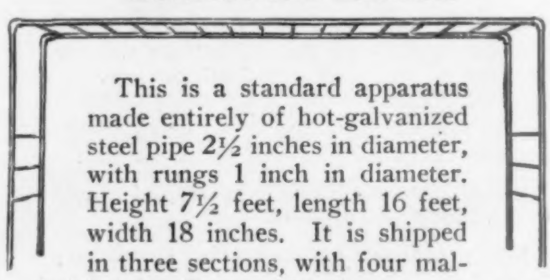
THE "SAFE-PLAY" NO. 280

OTHER TYPES AND SIZES OF SWINGS



Playground outfits are furnished with three swings, six swings, or combination swings, rings and trapezes. The material used is galvanized high-carbon steel tubing, painted aluminum—fifty per cent stronger than pipe. The swing hangers are ball-bearing.

HORIZONTAL LADDER



This is a standard apparatus made entirely of hot-galvanized steel pipe 2½ inches in diameter, with rungs 1 inch in diameter. Height 7½ feet, length 16 feet, width 18 inches. It is shipped in three sections, with four malleable-iron elbows. Headless set-screws are used so that nothing protrudes to cause damage to clothing. Weight, 309 pounds.

PITTSBURGH-DES MOINES STEEL COMPANY

53 Neville Island,
Pittsburgh, Pa.

657 Hudson Terminal Bldg.,
New York City

955 Tuttle St.,
Des Moines, Ia.

3169 L. C. Smith Bldg.,
Seattle, Wash.

1263 First National Bank Bldg.,
Chicago, Ill.

367 Rialto Bldg.,
San Francisco, Calif.

Builders and Fabricators of the
Pittsburgh-Des Moines
ALL-STEEL GRANDSTAND

The Pittsburgh - Des Moines all-steel grandstand is so designed and built that it is directly adapted to athletic fields of universities, colleges and schools. This stand provides a maximum seating capacity for any available area at a minimum cost. It is an absolutely permanent structure and cannot possibly collapse. Steel will not burn or deteriorate under the action of the weather.

This steel stand is constructed of heavy interlocking steel plates formed into steps. All loads coming on these steps are carried to the ground by steel beam stringers and structural steel columns. The seats, which are of wood, are raised several inches off the steel steps and take no part in carrying the loads of the stand.

This steel grandstand has many advantages and outstanding features.

If desired, it can be architectually treated with little cost by building an outside wall of brick, concrete, or expanded metal with stucco around the two ends and back.

Upkeep is very small as an occasional coat of paint is all that is required.

The seams of the steel plates are water tight and dressing rooms, etc., can be easily and inexpensively built under the stand.

The investment value of the steel grandstand is high as it can be taken down and relocated anywhere.

The seating capacity can be easily and inexpensively increased by extending the stands at the ends or back or by building an upper deck.

This steel grandstand can be furnished and ready for use within a remarkably short time.

This new grandstand will earn its own cost through our new deferred payment plan.

Write for further information. It will be gladly furnished free of any obligation.

Section VI

CLASSROOM, OFFICE, LIBRARY AND AUDITORIUM

Adequate Auditorium Stages for School and Community Use

BY FRANK G. PICKELL

SUPERINTENDENT OF SCHOOLS, MONTCLAIR, N. J.

RELATIVELY few school stages are adequate to meet the legitimate demands of the modern school program. The modern school makes use of its auditorium quite as much and effectively as it does other special rooms. Education today consists of much more than a program of instruction in the three R's. With the growing importance of dramatics, musical productions, operettas, and other school activities, it has been clearly realized that the average school stage is poorly planned and affords inadequate facilities. In addition to the demands of the modern school, community organizations have sprung up in great number in response to an awakened public interest in dramatics and music. To a greater extent than ever before, outside organizations are calling upon the schools to provide them with a place for their dramatic and musical productions. The Little Theater movement has indeed spread to the cities, towns and hamlets of this country.

The writer has personally examined scores of school buildings and many sets of architects' plans for buildings, and the auditorium stage that is adequate is rarely found. There may be some excuse for an inadequate stage in a building built some ten or fifteen years ago, but there is no excuse for repeating those mistakes over and over again in the present day. For some time there have been in existence reasonable standards for auditorium stages, but for some reason these are not being lived up to in the school buildings being erected now. Those in the public school system who are responsible for the preparation of plans either have not known what is an adequate stage or have not sufficiently insisted that the standards be met. Architects take great pride in their work, and one cannot say that they have been satisfied with the kinds of stages developed in the past. The difficulty is probably to be found in the lack of general knowledge of what constitutes an adequate school stage.

What Is Meant by Adequacy

Most auditorium stages are too shallow, do not have sufficient height back of the proscenium arch, have no rear passageway, no service doors for the handling of scenery, little or no provision for dressing-room space, or the handling of large numbers back-stage with ease and rapidity, and the lighting is usually very poor.

There are presented, herewith, four architects' drawings of two school stages. Both of these are junior high school stages, but they will serve to illustrate what is meant by adequacy.

A study of Figure 1 will serve to emphasize certain necessary features in connection with the school stage, whether it be for the elementary, junior or senior high school.

If this stage were developed for an elementary school, except for a large elementary school, it could be simpler in many ways, but if it were being developed for a senior high school, it would be inadequate in point of depth; otherwise it would be satisfactory (with the changes noted hereafter) for a high school up to 1,000 pupils.

How This Stage Might Be Improved

It should be borne in mind that this is an exact plan of a stage in existence. It may be well, then, to begin by pointing out its inadequacies and where changes should be made.

The depth should be increased from 3 to 6 feet. The depth as shown in the illustration is 19 feet back of the proscenium arch.

It is a mistake to have the platform or apron extending more than 4 feet out in front of the proscenium curtain. The arrangement shown in Figure 3 obviates this weakness and still provides for direct access to the stage from the audience space. The apron should have just a hint of a curve in it. (See Figure 3). Footlights should be of a disappearing type, and arranged in sections approximately 5 feet in length. This is the type used on this stage.

At least one drinking fountain should be located back-stage.

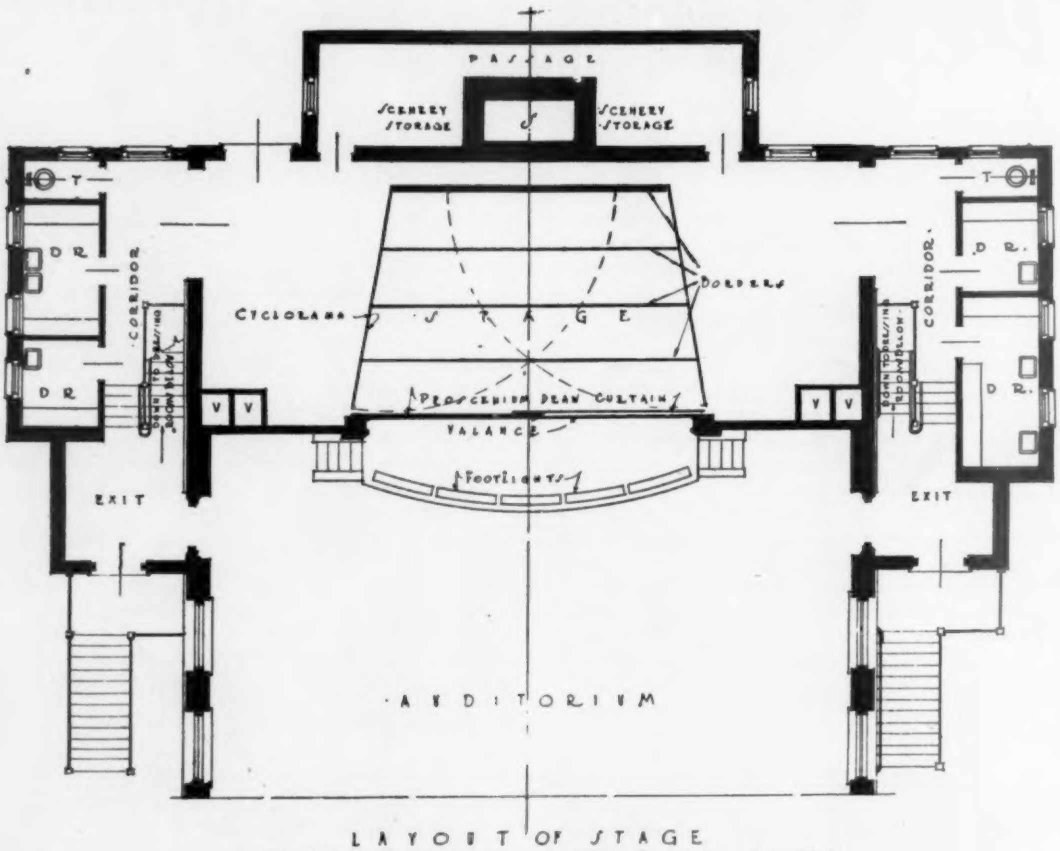
Features Which Make for Adequacy

In pointing out the features of this stage that make for adequacy there should be mentioned:

The back-stage service door at the rear left. It is possible to make delivery of pianos and scenery directly to the stage through this door, and the necessity of taking this type of equipment over the footlights is obviated. This is a common oversight in planning stages. The service door should be double, at least 6 feet in width and 7½ to 8 feet high. If the stage floor is 8 or 10 feet above ground level, a block and tackle should be provided so that heavy equipment can be readily handled.

total of five such rooms for boys and an equal number for girls. The stairways at each side of the stage lead to the dressing-rooms below.

There are outside entrances to the dressing-room spaces on the floor below, so that the actors may drive to the rear of the stage and enter directly through those doors. This is of great convenience in case some community organization is using the auditorium. With adequate dressing-room space thus directly accessible, the stage actually becomes a self-contained unit.



LAYOUT OF STAGE
GEORGE INNESS JR HIGH SCHOOL
MONTCLAIR N J

FIGURE 1

A rear passage is provided for the convenience of participants in dramatic and other activities, with some storage space for stage furniture and scenery. As a matter of fact, in this particular stage one of the places marked "scenery storage" is now used for the storing of the school's costumes, and this is a very important thing to keep in mind in planning stages. At the right-hand side of the stage there is an overhead storage space provided for scenery sets. On either side are shown two dressing-rooms and a toilet. This stage happens to be above ground level, so that it is possible to provide three dressing-rooms on each side directly below the two shown, making a

These doors leading directly to the dressing-rooms are, as has been indicated, service entrances, and the trunks and other paraphernalia belonging to the actors can be brought directly in on that floor and stored in the space provided for that purpose. To repeat, there are five dressing-rooms, besides the storage space mentioned, on each side of the stage.

Each dressing-room, depending on its size, has one or two mirrors and one or two lavatories. The mirrors, which are placed above a built-in dressing-table, are provided with three electric outlets each, two on the sides and one over the mirror. The dressing-rooms are further equipped

with liquid-soap containers, coat hooks and hangers, and an electric service outlet.

A Too Common Mistake

Probably one of the most important criticisms to be offered against the average stage is that there is insufficient space from the side of the proscenium opening to the side wall of the stage. In other words, it is common to find from the side of the proscenium arch to the side wall back-stage a distance of not over 3 or 4 feet. It is very difficult to handle dramatic productions under such limitations, and yet this mistake is repeated over and over again. It is a safe plan to have open space back-stage on each side equal to one-half the proscenium opening. Examine Figure 1 to see whether this has been followed. Whatever the temptation may be to cut down on this space, it should not be done. This amount of space allows room for the congregation of actors in chorus productions, provides space for stage settings, and the temporary storage of equipment which must be held in readiness for the next scene, so that it is possible to put on a two-, three- or four-act production without waste of time.

It is very essential that the back-stage height should be about 2 feet more than double the height of the proscenium opening. This is the minimum distance that should be provided between the floor of the stage and the grille work to which are fastened the pulleys, sheaves, etc., for hanging the drops, cyclorama and scenery. Between the grille and the roof there should be a space of from 3 to 4 feet. Some advocate a greater height than this between the grille and the roof, but it is not necessary, because after the first installation of the border lights and cyclorama and other permanent fixtures, together with spare battens, the occasions are rare when workmen spend much time above the grille.

The back stage should have a skylight for ventilation. The sashes should be so hung that it is possible to operate them from the floor of the stage. The panes of the skylight should be painted black. This will obviate the necessity of draw curtains.

Some authorities advocate an orchestra pit, but this is a doubtful necessity. It should be classed as desirable rather than necessary.

The above discussion has been based upon Figure 1. Figure 2 gives a cross-section of the same stage and shows the relative position of the

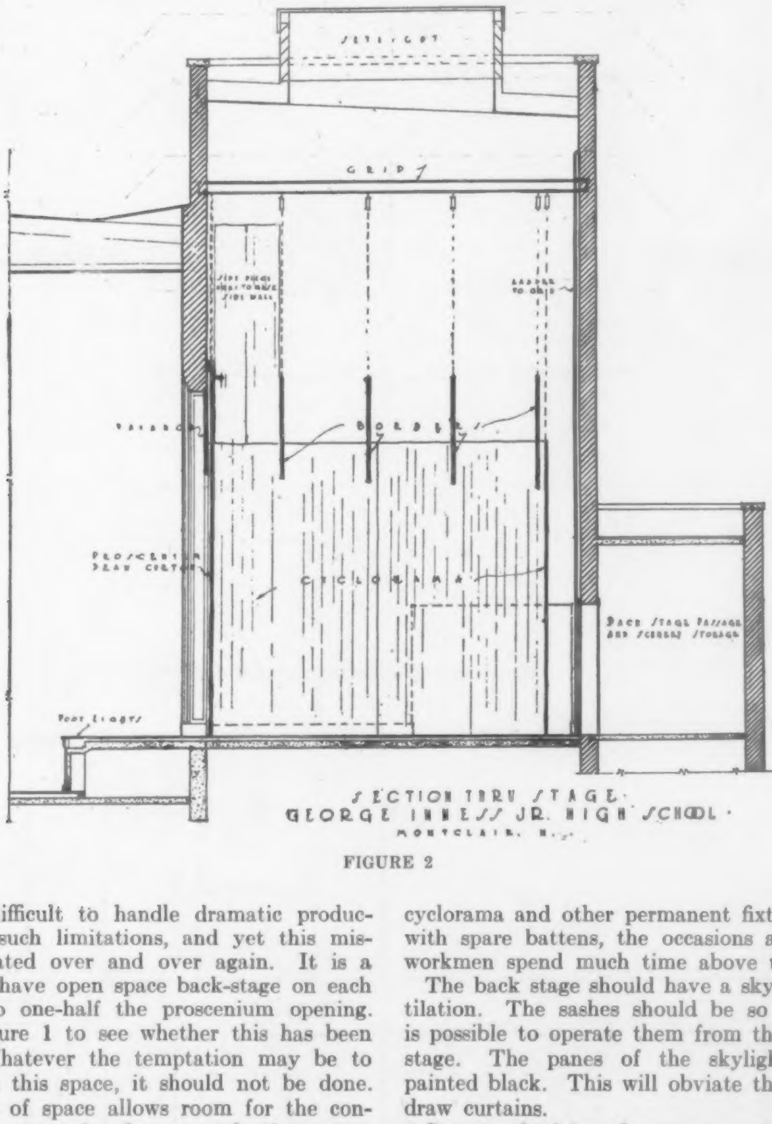
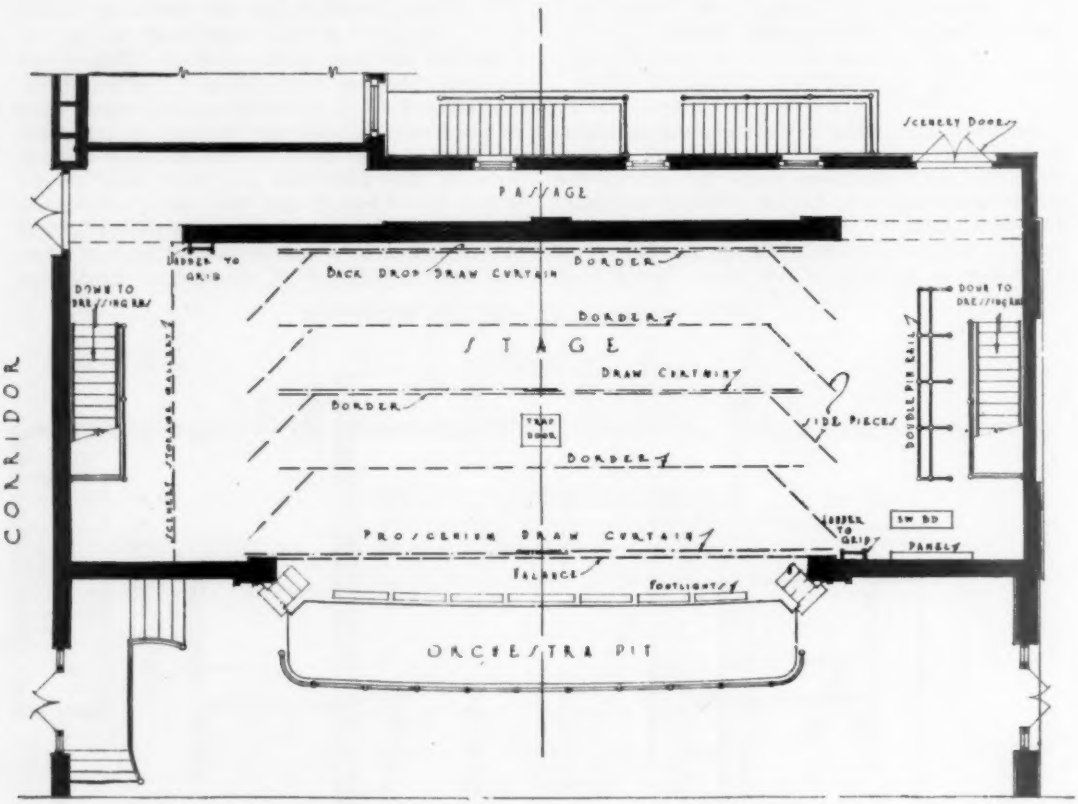


FIGURE 2



LAYOUT OF STAGE
Mt HEBRON JUNIOR HIGH SCHOOL
MONTCLAIR N J

FIGURE 3

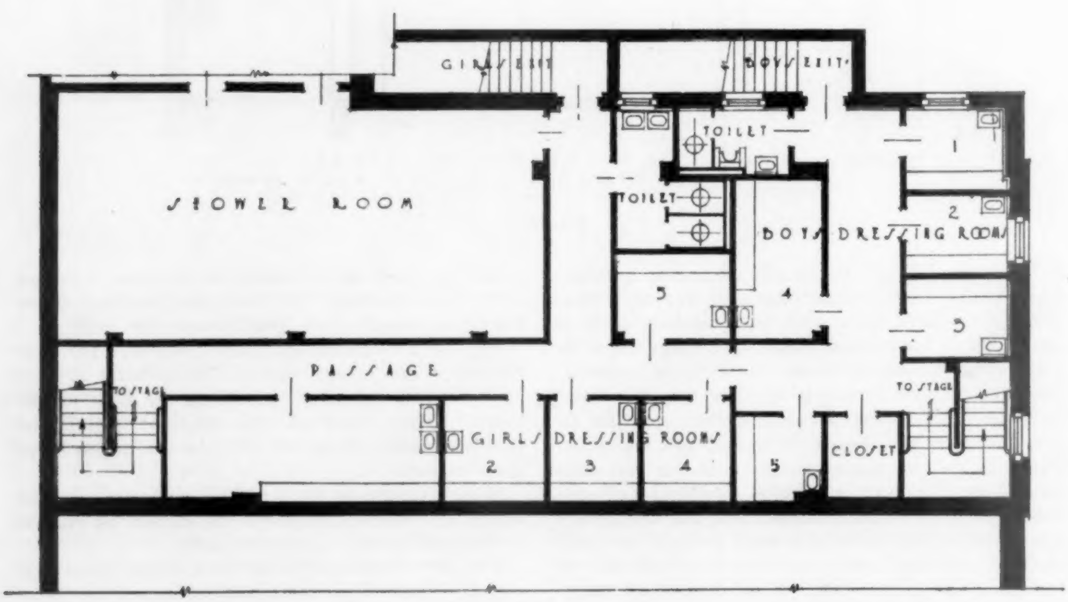


FIGURE 4

grid, skylight and other features. Figure 2 does not show the dressing-room arrangement below stage level. It will be noted from Figure 2 that this stage requires the use of a proscenium valance to mask the cyclorama when drawn up to the grid. There is no particular objection to this, but either the distance above the proscenium arch itself to the grid must be 2 feet greater than the height of the proscenium arch or the height above the proscenium arch must be increased by the use of a valance. Either plan is satisfactory, but a valance is necessary to regulate the height of the proscenium opening to suit the settings for various scenes.

A Stage Layout Which Meets the Foregoing Objection

Figures 3 and 4 are presented to show another junior high school stage layout which meets the various objections offered against the stage layout in Figure 1. It will be noted that the stage in Figure 3 has a depth of 25 feet from the proscenium arch to the back wall. The back stage on either side of the proscenium arch is about equal to one-half of the opening. It may be well to state here that the proscenium arch should be no higher than necessary in order to give a person in the highest seat in the balcony a clear view of the back wall of the stage up to a height of approximately 9 feet.

In this school the dressing-room provisions are taken care of directly underneath the stage. Figure 4 shows the plan. The shower-room at the left in Figure 4 is a part of the layout for the girls' gymnasium and should not be considered as part of the stage layout. At the right front of the dressing-room plan one will find a closet. This is planned for the storage of school costumes and other equipment which should be kept under lock and key.

In Figure 3 the scenery storage gallery is about 14 feet from the floor, so that it is possible to store scenery underneath as well as above. Block and tackle arrangement is provided to pull the scenery up for storage. The back wall of the stage should be painted blue, and no objection can be offered against leaving portions of the wall white, as this gives a very naturalistic effect to an outdoor scene when proper use of the lights is made. A trap-door is provided, not so much for school use, but for adequacy in case outside organizations wish to use the stage.

Attention should be called to the type of cyclorama shown in Figure 3. It is quite superior to the type shown in Figure 1. The whole stage is masked with curtains hung as indicated in the drawings. It is possible to clear the whole stage and still have the sides masked, or clear any portion of the stage. A double pin rail is provided because it is advisable to have the necessary pulleys and chains not only to take care of the school scenery, but to take care of the additional battens and rails that are always required for the installation of special scenery and lights. With this arrangement it is possible to pull up the regular stage equipment and then quickly install the special equipment and floodlights required for the special production.

The stage should also have a built-in cupboard for the installation of a radio which can be kept under lock.

Electrical Equipment

With regard to the electrical equipment, the layout for both of these stages is the same and is adequate for any junior high school and for the average senior high school. The senior high school stage may be more elaborately equipped, if it seems advisable, simply by extending the provisions described in the accompanying article or by adding such things as mechanically controlled dimmers and stage pre-sets. The switchboard should be located near the front on either the right or the left side. There should also be provided a separate panel, usually called a company switch, to take care of special switchboards which may be required for special entertainments.

Attention should be called to the stimulating booklet on "Scenery and Lighting for School and Little Theatre Stages," by Samuel Selden, Technical Director, The Carolina Playmakers, and published December, 1928, by The University of North Carolina Press. The booklet contains an interesting and helpful bibliography.

A buzzer system should be provided for the dressing-rooms so that the stage manager can call the principals as their appearance is necessary. The stage should also be provided with a telephone. There should be a telephone in the picture booth and also one for the director of the orchestra. Telephones should be of the plug-in type. It is also advisable to have a telephone on the main floor of the auditorium near the entrance. No lighting equipment should be considered standard that does not provide for remote control so that the general illumination can be controlled from the moving-picture booth.

As was stated, the stage represented by Figures 1 and 2 is now in use. The second stage, Figures 3 and 4, is planned for a building which will be under construction beginning in May or June of the present year. The architects for these buildings are Starrett and Van Vleck, of New York City, through whose courtesy the drawings for this article are presented.

The engineers for these buildings were Runyon and Carey, of Newark, N. J. P. C. Carey, who was primarily responsible for the electrical layout of the two stages described in this article, very kindly prepared the following material on "Stage Lighting for Schools."

Stage Lighting for Schools

BY P. C. CAREY

RUNYON AND CAREY, ENGINEERS, NEWARK, N. J.

STAGE lighting for both junior and senior high schools is receiving more and more attention from boards of education, and in some recent installations the completeness of the equipment has approached that used for theater control. In general, however, a simpler system can be adopted which will afford results entirely adequate for the requirements of the average school, yet be suitable for amateur productions and often meet the demands of a professional company.

The installation recently made in the George Inness Junior High School, and that proposed for the Mt. Hebron Junior High School, of Montclair, have been designed along conservative lines and yet sufficiently complete to meet the conditions above stated.

The control by dimmers of the general illumination of the auditorium has not been considered essential until recently, but the development of the average moving-picture house has included such control, with the result that the public, quick to notice the sudden lighting or extinguishing of lamps, draws adverse comparisons when dimmer control is not used.

This addition to the equipment is a comparatively small item, as three or four dimmer plates will represent the only increase in the investment.

The stage lighting will consist of three essential parts—footlights, border lights and stage pockets, and we will discuss them in that order.

Footlights

The footlights should be of the disappearing type, made in sections about 5 feet long, and extending the full width of the stage front. This type of footlight, when not in use, can be closed down and becomes flush with the stage floor. Footlights should be equipped with one circuit each of white, red, and blue, or, if desired, amber can be substituted in place of the red or blue, as lighting conditions may require. The disappearing type of footlight has marked advantages over the open type. Stage illumination from this source is infrequent compared to the use of the stage for other purposes, and with the footlights closed a flush surface is exposed, eliminating projections or depressions in the floor. Breakage of lamps is prevented, and unauthorized tampering or theft. The lamps and reflecting surfaces remain clean, and are always ready for service.

Border Lights

The border lights are installed to illuminate the stage floor, drops and scenery.

The number of borders is dependent on the depth of the stage, but in general a spacing of 5 to 7 feet, starting at the rear of the curtain, will afford adequate illumination. Borders are obtainable in many types, all of which are effective. The simplest variety consists of a galvanized iron trough, enameled white, in which are set a row of lamps, or in larger styles two rows of lamps. This type of border uses lamps up to 60 watts. Borders for larger lamps are made with separate compartments with special reflectors and removable frames in which colored gelatine screens may be set. This lends a flexibility to the lighting which is not obtained with the plainer type of borders, but is not essential for school equipment.

The plain trough type border is therefore recommended, the wiring to provide for two circuits of white lights, and one each of red and blue, or amber may be substituted as in the footlights.

Borders should be suspended with steel cables from overhead pulleys and counterbalanced with weights on the side walls. Operating cables to the fly gallery rails should be provided.

Stage Pockets

The stage pockets are to provide current supply for special lighting of the sets and scenery. Pockets are placed in the stage floor in locations to clear the scenery.

Circuits for lighting the lamps in a scene, such as table lamps, wall lamps, etc., are obtained from this source, also circuits for flood-lighting the scenery, or for spot lights and color effects.

Stage pockets should be double type with two receptacles and plugs, one half to be used for stage lights and the other half for scene lighting which is under dimmer control. Seven outlets will be sufficient unless the stage is very deep, three on each side and one in the rear.

Other Details

Spot lights in the balcony or moving-picture booth can be operated from the terminals provided for the picture machine, and as these projectors are portable and purchased as a part of the school equipment, there is no need of entering into details such as have been covered in the description of permanent fittings.

The lighting control panel should be located so that the operator will have a view of the stage and be able to observe the progress of the performance. Proper coordination between lighting effects and acting cannot be obtained otherwise.

The switchboard must be of the dead front type

with lever handles operating the switches on the rear of the board.

The lighting circuits should centralize in a magazine panel in the lower part of one of the panels so that the fuses will be accessible from the front. These circuits should be combined through the main switches so that they will be suitably grouped for simple control.

Master switches should be provided for each of the colors in the foots and borders, these to correspond with the subdivisions for dimmer control; also two switches for each of the pockets, one on the direct circuit, and one on the dimmer circuit.

In the larger installations, a two pre-set board is desirable with two position circuit switches and two master switches. This affords a quick and easy method of changing lighting effects between scenes, and adds a flexibility that is highly desirable.

In addition to the main line switch controlling all current to the board, there should be a switch and terminals of equal capacity to which traveling companies may connect their own equipment and omit any or all of the regular switchboard control, or to which special apparatus may be connected which cannot be served from the stage pockets.

The dimmer equipment is usually mounted in one or two banks above the panel at such a height that the levers may be reached and easily operated either directly from the floor or from a movable platform not over 8 inches high.

Dimmers should be provided of the capacity for the various circuits, those for the auditorium to be fitted with a master lever.

The grouping of dimmers and the control for the stage should be as follows:

White lights in foots	1 dimmer
" " " border No. 1	1 "
" " " " " 2	1 "
" " " " " 3	1 "
One master lever for all white lights.	
Red lights in foots	1 dimmer
" " " border No. 1	1 "
" " " " " 2	1 "
" " " " " 3	1 "
One master lever for all red lights.	
Blue lights in foots	1 dimmer
" " " border No. 1	1 "
" " " " " 2	1 "
" " " " " 3	1 "
One master lever for all blue lights.	
7 stage pockets	7 dimmers
One master lever for all pockets.	
One grand master lever for all stage lights.	

If the number of dimmers is over twenty, it is desirable to add a slow-motion wheel, as it is very difficult to operate the grand master lever gradually enough to obtain slow fading or increasing effects, which are so often desired.

These suggestions for equipment have been developed after several years of experience with schoolhouse demands, amateur theatrical companies, and occasional professional troups.

The Present and Future of Radio in Public Education

BY ALICE KEITH

LONG ago, in the days of the old Greek philosophers, when youths were taught by the conversation of their elders, a future in which education could be obtained universally through the visual aid of printed words was not considered a possibility. Today, we, who have become accustomed during centuries of tradition to receiving information through the sense of sight, are confronted with the possibility of a reversion to the earlier methods of the ancients.

Radio is bringing to humanity a new means of education through aural perception. Although as yet it has functioned chiefly in the realm of music, which is primarily an "aural art," its usefulness in other fields of learning is gradually being felt by educators.

Past Experiments

In spite of the fact that radio is essentially a thing of the future, much has already been accomplished in the way of educational broadcasts. The schools of Oakland, Atlanta, Cleveland, and Chicago have conducted several series of daytime programs. The extension divisions of practically every state university in the United States have broadcast lectures. In Iowa, regular college credit is given to students enrolled in the radio classes. Several state departments of education have interested themselves in state-wide broadcasts, Connecticut and Ohio serving as outstanding examples.

Two series of educational concerts have been broadcast over chains of stations during the current school year (1928-29). On the Pacific coast, stations in Los Angeles, San Francisco, Oakland, Portland, Seattle, and Spokane have relayed lecture recitals under the auspices of the Standard Oil Company of California. WJZ and a chain of twenty-eight associated stations east of the Rockies have carried the RCA Educational Hour, directed by Walter Damrosch, to hundreds of thousands of school children from Maine to Colorado, and from Minnesota to Louisiana.

The Programs

There are many problems to be solved in connection with educational broadcasting. Who, for instance, is best fitted to determine the type of programs best suited to the schools? What artists

CLASSROOM, HENRY CLAY FRICK TRAINING SCHOOL FOR TEACHERS, PITTSBURGH, PA., ONE OF THE THOUSANDS OF CLASSROOMS THAT LISTEN IN REGULARLY TO DAMROSCH PROGRAM BROADCAST EACH FRIDAY FORENOON

and lecturers shall broadcast, and under whose financial sponsorship shall educational broadcasting be presented? Unquestionably, recognized leaders in the educational field should hold the reins, and the highest type of speakers and performers should be obtained. To date, school programs have been broadcast by educational institutions and by advertising industries.

Publicity Necessary

A second problem arises in the dissemination of information about broadcasts. In Kent, England, illustrated textbooks may be obtained for a penny apiece. In America, pamphlets have been prepared by the sponsors of programs. Questions and answers, as well as program notes on the symphony concerts broadcast under the direction of Walter Damrosch, have been printed regularly in hundreds of newspapers for the benefit of the adult as well as the school public.

The third problem, which is quite as important as broadcasting and disseminating information, is that of classroom reception. The greatest benefit can be derived from educational broadcasts only when proper and regular adjustment is made in the curriculum and when suitable physical equipment is installed for reception.

Classroom Procedure

Then, too, a classroom technique must be developed. Classroom conditions should be maintained whenever possible. It has been found that when large groups of children of different ages are crowded together for a long period of time, no benefit whatsoever is derived from the listening period. Only students of college age are able to concentrate in large groups. A teacher should be in charge of each listening class, giving necessary information before the period commences and leading a brief discussion at the close. Visual aids should be used freely. In musical concerts, pictures of instruments, composers, and artists should be shown; in lectures, pictures pertaining to matters under discussion. Program notes and recorded music should be used in previous preparation for concerts whenever this is possible.

Only children of the ages specified on any given schedule of concerts should listen in. There is as much difference in the musical taste of a third-grade child and of a Junior High School student as there is in their literary taste.

No matter how well programs may be planned, how fine the artists may be, how thorough advance preparation may be, how skillfully the teacher

may conduct her class, there is one problem of prime importance—physical equipment. Many a radio experiment has failed miserably because an inadequate receiving set has been used in an overcrowded auditorium.

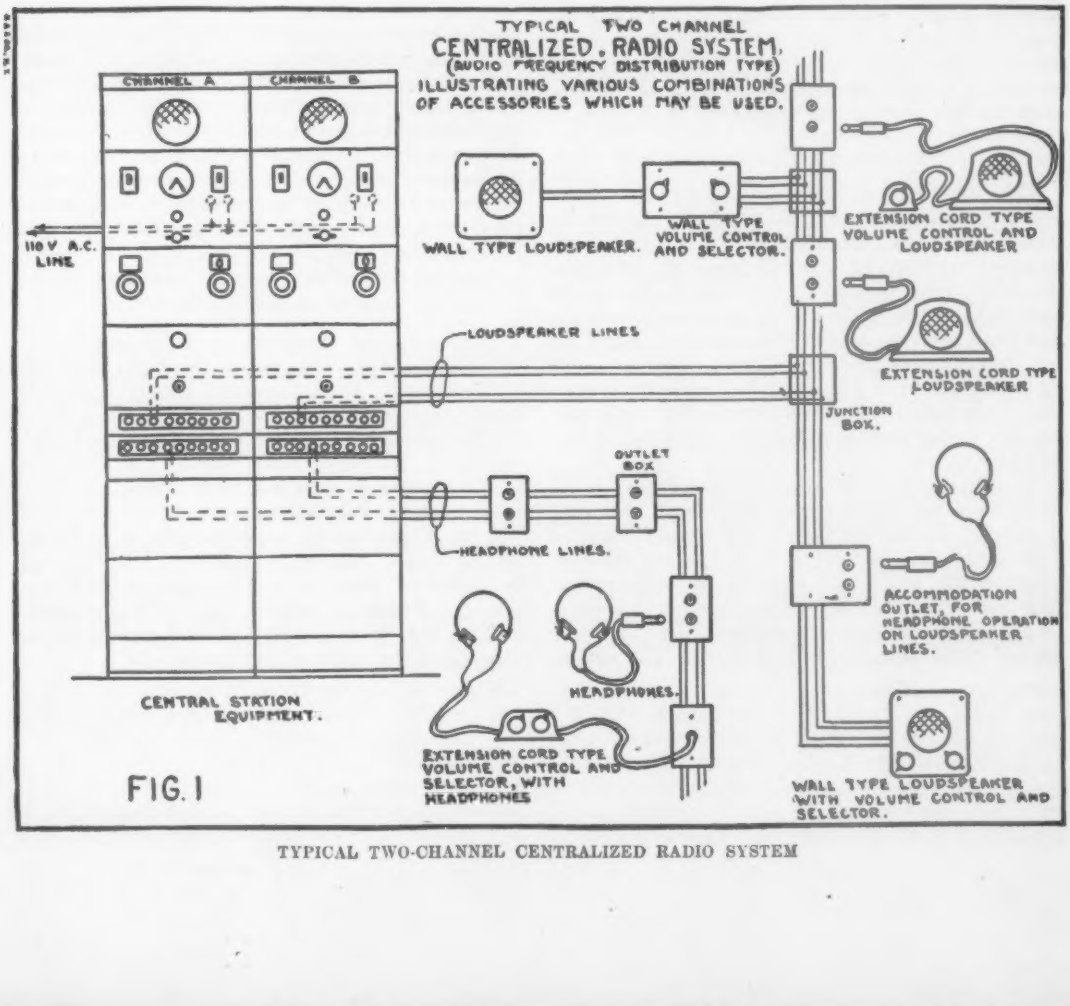
Before installing any equipment, the size of the audience, the age of the listeners, and the peculiar physical conditions of the room should be studied thoroughly. In the case of a classroom with not over fifty children, a small radio set may be employed, either of the battery-operated or socket power type. The investment is modest in either case, for the set is comparable with that in the average home.

The Battery Set

The better type of battery receiver today has proved highly satisfactory for individual classroom radio. Compact, battery-operated, with single dial control, amply sensitive and selective, it provides good service with a suitable loud speaker. It may be installed anywhere in the classroom, since it requires little space. The installation is little more than connecting it with a short antenna to the nearest water or heating pipe. The volume is sufficient for the average classroom if close attention is paid by the pupils, and the tone quality is of a high order. Any one, including the youngest child, can operate such a set and obtain the same results as would the expert with the most elaborate radio receiver. The battery-operated set is perhaps most popular in the rural school that is not wired for electricity.

The Electrified Sets

When lighting current is available, the advantages of socket power operation are not to be denied. First of all, socket power means endless and constant power at the snap of a switch. It means the lowest cost of operation, since batteries have always been the biggest item of cost in the battery-operated receiver. Then, too, it produces greater volume and more realistic tone quality, due to the use of a power tube of ample capacity. In the moderate-priced "electrified" radio set, there are compact, simple, inexpensive socket power receivers for individual classrooms or small schools. The typical socket power set will operate two usual loud speakers placed in the same room for greater volume and realism, or placed in separate rooms. Such a receiver also features extreme sensitivity and selectivity with utmost simplicity of operation. The tone quality is a close approach to realism with ample volume for the small classroom.



TYPICAL TWO-CHANNEL CENTRALIZED RADIO SYSTEM

The Dynamic Speaker

In the school auditorium, additional amplification is necessary. It should be noted that a radio loud speaker is an electric power device in much the same sense as is an electric motor. The loud speaker converts electrical energy into mechanical work, which, in case of radio, is the vibrating of more or less air space. Obviously, the school auditorium, measuring many times the size of the classroom, contains many times as much air space to be set into vibration. Therefore, a far more powerful loud speaker is required, actuated by a power amplifier of the largest kind. Receivers for this purpose are now available to operate powerful loud speakers, mounted on suitable baffle-boards for proper acoustic effects.

A Popular Model

One of the most popular of all school radio installations is a combination of a super-heterodyne radio receiver and the power loud speaker. This combination is completely socket power operated and requires only a small indoor antenna and ground connection. It can accordingly be placed in any desired location and can be moved to different locations without difficulty.

Such a combination represents a balanced ensemble which possesses a great reserve of power. It will readily fill a small auditorium with voice and music at a volume and tone closely approximating actuality. Despite the remarkable results obtained, the operation of such a combination is extremely simple and requires no technical knowledge on the part of the operator.

Centralized Equipment

The question of extension wiring for loud-speaker stations is one that must be considered from every angle. Economically, it is a matter of whether a powerful central receiver, with individual wiring to many loud-speaker stations, is as satisfactory as individual or semi-portable radio sets that may be carried from room to room or left permanently installed. It is certain that if an entire school is to be supplied with simultaneous programs, then a central receiver with extension wiring and separate loud speakers is the obvious choice.

In connection with school installations, engineers have developed special centralized radio receivers of the highest type. The typical installation comprises a central receiver and switchboard arrangement, which also includes the radio power unit for supplying the various voltages required from the lighting circuit, a powerful amplifier and control panel and distribution panel. The extension wiring makes possible the installation of temporary or permanent loud speakers in any part of the school building. For each program to be distributed there is a separate switchboard arrangement, together with separate extension wiring. Thus, with two or three sections or central stations (channels), two or three simultaneous programs may be received with the choice of two or three programs in any part of the school. During the intervals when no suitable radio programs are available, an electric phonograph may be included in the installation.

The Future

Although radio, in the short time that it has been available for use, has appealed greatly to the imagination of school administrators, its possibilities have only faintly been sensed. Music will doubtless be brought to the schoolrooms of the future even more than it is today, not only symphonic music but chamber music, opera, oratorio and diversified programs intended primarily for very young children. Musical programs can and will bring much correlative material for use in geography and history classes.

Speech and Literature

The increasing amount of emphasis placed today on correct speech will bring the radio of the future into greater prominence in the training of the ear to hear speech defects. The enunciation, pronunciation, and voice placing of trained orators and readers should serve as a means of overcoming the growing tendency toward dialect formation found today in all parts of America.

The presentation of literature over the radio, and speeches of great personalities, will doubtless play a bigger part in the teaching of English than it has in the past.

The Social Studies

History taught by means of dramatization and music will surely be a part of the radio programs of the future. In fact, current history is already being brought to each schoolroom when great events like the presidential inauguration are broadcast.

The geography class will be vitalized by travel talks augmented by visual aids; health programs will be stimulated by radio lectures; folk dances will be taught; and numerous other activities will be aided by radio in many ways not yet conceived. Pupils in schools all over the globe may be able to see, as well as hear, events taking place in other parts of the world.

Equipment Apparatus That Lends Itself to Modern Progressive Ideas in Education

BY W. H. HOLMES, PH. D.

SUPERINTENDENT OF SCHOOLS, MOUNT VERNON, N. Y.

THE modern progressive school is coming more and more to be a workshop, or, better, a studio, where boys and girls, little or big, pursue their tasks with zeal and joy. This kind of school requires more for its equipment than fixed desks and chairs at which pupils are required to sit all day in the traditional book-pencil-and-paper school.

In the last ten years greater changes have taken place in the equipment of the more progressive schools and schoolrooms than took place in the preceding one hundred years. The changes have come about because of our greater knowledge of the psychology of childhood and youth. We have learned that boys and girls are educated by what they do, rather than by what they say and read; hence, the stress upon activities of various kinds, and the name *Activity Schools* that is being assumed by many of the progressive institutions in this and other countries.

The newer psychology teaches that genuine interest follows rather than precedes any activity, either physical or mental. Curiosity may lead one to try something new, but there is no genuine interest until some degree of success has come from the trial. The child or adult who finds he cannot succeed with what he is doing soon tires of it and drops the task, unless compelled to continue it. Doing within the ability of the doer is the basis of the modern school.

Schoolrooms equipped for doing are at present more characteristic of the kindergarten and earlier primary grades than of the middle, upper, and high school grades. This article will be confined chiefly to equipment for kindergarten and primary classrooms, workrooms and playrooms. THE AMERICAN SCHOOL AND UNIVERSITY of last year dealt to a considerable extent with equipment and apparatus for the upper elementary and high school grades.

Kindergarten Equipment

Self-activity on the part of the little child was the core of the philosophy of Froebel, the founder of the kindergarten.

The weaving, sewing, and building connected with the "gifts" of Froebel were all good for a beginning, but they represented too largely what an introspective adult thought would be good for little children to do, rather than the things that live, growing children would naturally do. In general, the gifts consist of things that are too small for little children to use, or that require for their manipulation too fine muscular coordination. We find, therefore, in the modern kindergarten that the gift material of Froebel and his more immediate followers has been displaced by material and apparatus that come within the limits of ability of little children, both physical and mental.

The piece of equipment most characteristic of the traditional kindergarten was the long, rectangular table at which were usually seated six or eight children. In the modern kindergarten this has been superseded by smaller square or round tables seating only four and sometimes only two children. These tables give more room to each child than did the longer tables. It is the opinion of the writer that while the circular-topped tables may look more attractive, the square-topped tables are much better work tables for little children. They have all the advantages afforded by grouping, while making it possible for each child to do his own work better. The circular table, both in the kindergarten and in the primary grades, tends to lessen independent work more than does the square-topped table. With the latter, each child is almost bound to keep within the limits of his own working domain.

In many kindergartens now, the tables and chairs are painted colors to harmonize with the general color scheme of the room. The use of lacquer paint, which dries within a few minutes after application, makes it easy for the teacher and some of the older pupils of the school to redecorate the furniture of the kindergarten.

One corner of the kindergarten is often devoted to the paint shop or studio. On the floor of this section is a linoleum rug. Here are the easels and the tables at which the children may model with clay or various substitutes, paint pictures, or decorate toys or other objects to their hearts' content.

Another section of the room is devoted to blocks and building. Here, with the Hill or Trace blocks, the children may build houses, castles, wagons or trains, as individual or group projects.

Still another part of the room is a toy section. The dolls, with their cribs, cradles, carriages, furniture and dishes, have exclusive rights in this part of the domain.

Kindergarten dolls are now really wonderful creations. The girls are especially fond of the doll section. The boys take more naturally to the "Kiddie Karts," "Kiddie Kars" and other toys that require a little more strenuous activity. The slides, swings, seesaws and the various combination gyms, including the tower gym, the play gym, the small junglegym, the swing bob, the joy gym, are all popular. They are safe and furnish the

best of exercise in climbing, swinging, crawling and hanging—forms of exercise which the treeless, fenceless, modern city is making almost obsolete.

Every good kindergarten has its band. Even the smallest children can use with joy the drum, cymbals, tom-tom, triangle, tambourine, double clapper, chime bells, wood drums and whistles, while some of the more mature can play the xylophone.

Another valuable piece of equipment is the adjustable, collapsible frame made of three-inch wood strips which can be quickly put together to form a small play-house; a setting for dramatization or housekeeping as well as other projects. The better kindergartens are also equipped with sand tables. Some of these tables are fitted with hinged covers or tops so that they may be used for general purposes in case of need.

A very essential part of kindergarten equipment is the individual lockers built about the sides of the room. Here each child keeps his own material and projects. The sense of possession engendered by having a place all his own where he may keep his treasures is of high educational value.

The library corner, with its wide shelves for the big picture and story books, also is dear to the hearts of children.

A few kindergartens have a small wading pool in some appropriate space in the room. Such a pool has many uses. It may be the home of a few native fish or perhaps three or four goldfish. A tellurium and an aquarium will also be of interest to small children.

No kindergarten is complete without a small piano, finished, if possible, to match the color scheme of the room. A good Victrola with appropriate records is also essential.

Kindergarten teachers will also find a portable school duplicator very serviceable in many ways. Punches, simple looms of various sizes, stencils, wooden animal forms, sets of simple woodworking and garden tools, form necessary parts of the equipment of the modern kindergarten. Window gardens and, where possible, outdoor gardens, give little children a chance to know and love growing things.

Equipment for the First and Second Grades

The first and second grades usually constitute a working unit between the kindergarten and the third grade. The classrooms for these grades are coming more and more to take on the nature of workshops, or studios. In some schools each classroom has a workroom adjacent to the regular classroom, where the pupils do handwork of different kinds. These workrooms are equipped with benches and easels, kits for clay modeling and other apparatus. In other schools a specially equipped teacher has charge of what is called a special activity-room. To this room classes come at different periods of the day to work on their individual or group projects. One of these rooms, which is known to the writer, is equipped with special desk-workbenches so designed that the pupils may either stand or sit at their work. It is the opinion of the writer that before many years, nearly all schoolrooms for primary children, both regular and special rooms, will be so equipped that the children may either sit or stand at their work. It seems rather inconsistent, when one gives thought to the matter, that the ordinary school keeps children sitting practically all the school day, when in all other life situations they stand or sit at will. It is small wonder that many children take a dislike to school because of this repression and confinement.

Fixed desks and seats are rapidly disappearing from the better primary classrooms. The combined desk and seat, known as the Moulthop desk from its inventor, Colonel Moulthop, of Rochester, N. Y., has proved a blessing to many little children. The separate movable desk and chair are, in the writer's opinion, even better for ordinary school work. The desks, when well made, are more substantial and rigid than the combined desk and seat. They can be placed together in groups or moved easily from one part of the room to another. Furthermore, if there are only fifteen pupils in a class, only fifteen desks need be supplied. Surplus desks and chairs can be stored or taken to some classroom where needed. There is nothing more uninspiring than a classroom for little children equipped with row upon row of fixed desks and seats, many of which are unoccupied, but because it is so much bother to take them up, they remain from year to year, taking up valuable space and adding to the unattractiveness of the room. Many school furniture makers now supply movable desks and seats attractively designed and made. Earl Thompson has made a distinct contribution to the hygiene of school seating in the furniture he has designed for schools.

In the better primary schools blackboard space is being reduced to a minimum; in fact, there is little reason for blackboards in any schoolroom, so far as little children are concerned. They can do everything that they can do on the blackboard better on paper at their desks. When they learn to write on the blackboard they perform an entirely different set of movements from those they perform in learning to write at their seats. In addition, they fill the room with unhealthful chalk dust.

The writer knows several classes of children who have never used the blackboard as a piece of classroom apparatus. In the place of blackboards in the better schools are found display boards of cork, or of some similar material, covered perhaps with burlap. On these display boards is fastened the work the children have done at their seats. Display of children's work is one of the most neglected things in education, especially in primary education. Doing away with the gloomy, light-absorbing blackboard, which still occupies the wall space on three and sometimes four sides of the traditional schoolroom, will give space to display the children's work.

DESKS AT WHICH PUPILS MAY WORK EITHER STANDING OR SITTING

Pupils are shown using tools for woodworking and also the easel part of the desk for coloring with crayon or brush. The toys and bird-houses, drawings and paintings in this picture represent the work of first- and second-grade children

MOVABLE FURNITURE FOR PRIMARY GRADES

Manufactured by P. Derby and Company, and others. This picture also shows the Do and Learn plan of teaching reading, published under the name of "The Child's Key to Reading," by the F. A. Owen Publishing Company

Just above the tops of the display boards, as well as above the tops of the blackboards, if they are retained, a space should be provided for decorative borders. These borders can be drawn or painted by the teacher or preferably by talented pupils. By making the molding that surrounds these borders easily removable by using screws instead of nails, the borders could be painted or drawn on suitable material at the pupils' desks or benches and then placed in the border space and changed from time to time. Border decorations add much to the general attractiveness of a schoolroom.

There are now on the market a number of devices that make it possible to display maps, charts, papers and drawings along the top of the blackboard or display board. Any device that makes it easier to display pupils' work is of great value, as children as well as adults are spurred on to greater endeavor by having their achievements brought to public attention.

Visual Equipment

We learn to a large extent through the eye. For this reason the stereoscope, old though it be, is of value in all grades. It shows objects in three dimensions, something not possible with any other available visual instrument. Children are intensely interested in looking at pictures through the stereoscope. Too few primary classrooms are supplied with a set of stereoscopes and views.

A daylight projection lantern should also be available for use in all primary rooms. It is invaluable in teaching primary reading as well as in various other ways. By using as a screen a white sheet of paper, newspaper size, attached to the blackboard by rubbing with a sheet of celluloid, a clear picture can be shown and on it can be written in black crayon words designating the objects in the picture. The same picture can be shown on the blackboard but objects will be more obscure. By coating the blackboard with any of the pyroxylin paints, such as Duco, the paper in all except damp weather may be kept attached throughout a lesson period. For rapid word drill the teacher may attach word sheets or cards to the ordinary uncoated blackboard for short periods of time by rubbing them with a thin sheet of celluloid.

The small motion-picture machine is coming more and more into use in all classrooms. The development by the Eastman Kodak Company of the colored film will bring this form of instruction into still greater use.

Reading Devices

Devices for teaching little children reading and number have been developed by the writer and are now on the market under the names, "The Child's Key to Reading" and "The Child's Key to Number." Both devices appeal to the visual and manual senses of children. The children do and learn. They are active all the time, rather than the teacher. They therefore learn to read, count and measure with power and enthusiasm. The monotony of the old-time drill periods is largely eliminated.

At the same time that the children are learning to read they learn to write, using what is known as manuscript writing. This form of writing is largely used in England. It is so nearly like print that children have to expend little additional energy in learning to use it. It is a boon to small children, saving them from the harrowing drills attendant upon the ordinary slant writing with its difficult letter forms. Some of the modern primary schools are teaching little children to use the typewriter as a means of written expression. Here again little children are saved from expending much of the nervous energy that they are compelled to expend when using ordinary forms of written expression. Children enjoy manipulating the keys of the machine and are delighted to see the fruits of their efforts in neatly printed form. Typewriters with large-size type should be used for instructing little children.

Several forms of printing machines are in use in primary schools. With some, a single letter at a time is printed, using fonts of rubber type; with others, a whole word is printed at a time, which is a decided advantage over the tedious single-letter printing. In the Mount Vernon schools a modified printer's stick is used which enables the children to set up with rubber type letters a whole short sentence at a time. This sentence can be inked by means of a long ink pad and then the impression can be made on paper by the child. Children do this work with great delight. The modified stick makes it possible for the child to set up the words so that he can see them correctly spelled in their usual order, not backwards as in the ordinary printer's stick.

It is unnecessary to add that a great part of the equipment recommended for use in the kindergarten can be used as well in the first and second grades. The woodworking tools will, of course, be used with much greater facility by the older children, who will evolve many things in the way of toys, jumping-jacks, sawed-out animals, wagons, airplanes, bird-houses, puppet theaters. In fact, projects in wood and other materials that school people used to think were adapted only to upper-grade children can be made and made well by many first- and second-grade children. Not long ago a well-known educator of national reputation was visiting with the writer a primary-grade activity-room. He noticed a little writing-desk that one of the children had made. He said, "You don't mean to tell me that was made by a seven- or eight-year-old child." "Yes," I replied, "I am sure it was." I sent for the child who made it. In a few minutes in came a small boy of six. With the joy of achievement in his eyes, he told us that the desk was all his own work.

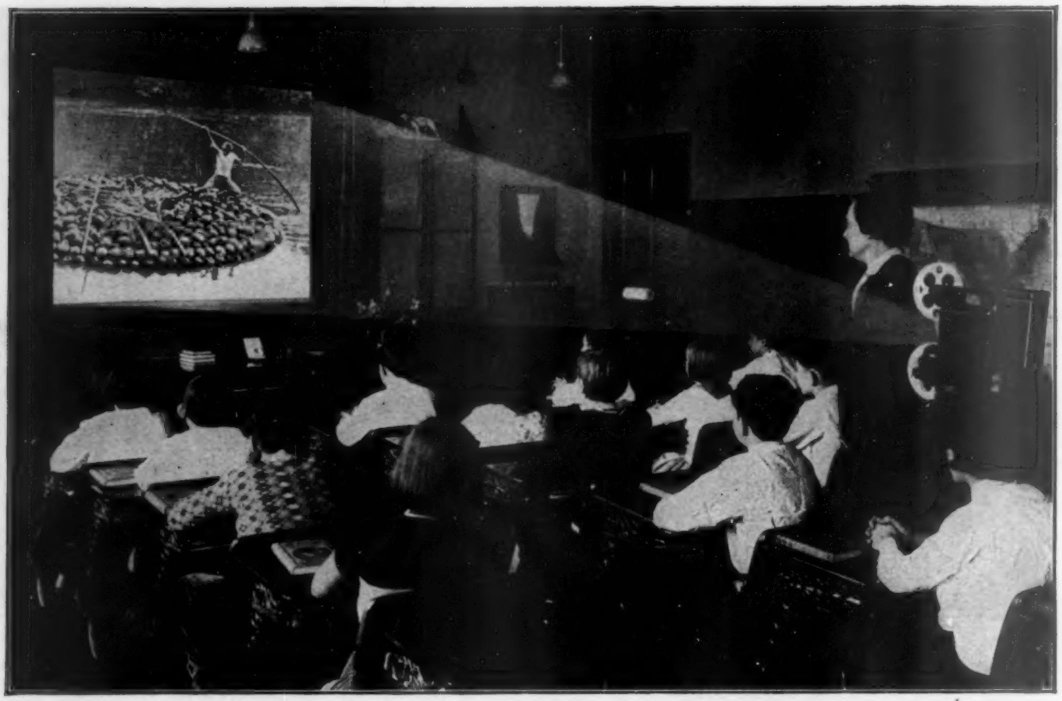
The progressive schools are giving little children a chance to do many things that heretofore they were thought not able to do but which in reality they can easily do and really love to do.

A CORNER OF A MODERN KINDERGARTEN

The house is built with Hill blocks, which are sold by nearly all kindergarten supply houses. The picture also shows the juvenile gym made by J. B. Hellenberg Co., Inc., dolls' furniture and play-house, a wicker or rattan library table, a toy grocery store in the farther corner, and on the kindergarten table several instruments for the kindergarten band. The parrots and canaries are a part of the equipment of many modern kindergartens

THE KINDERGARTEN POOL AND OTHER INTERESTING FEATURES

There is some dolls' furniture, the kindergarten easel, and a special form of teeter. Note also the window garden



How a Classroom Should Be Equipped to Show Motion Pictures

BY THOMAS E. FINEGAN

PRESIDENT, EASTMAN TEACHING FILMS, INC., ROCHESTER, N. Y.

TO properly equip a classroom for the showing of motion pictures, is relatively a simple procedure. The six essential features are as follows:

1. *Electrical Outlet.*—The place to install an electrical outlet in a classroom is in the baseboard at the rear of the room. It should be located a few inches from the floor so that cleaning solutions can not enter the opening, thus short-circuiting the line. The outlet should be opposite the middle aisle, so that the electrical cord of the projector may extend down this passageway. The wire for the outlet should be enclosed in a metal conduit and should be on a separate circuit from that of the classroom. A 10-ampere capacity line, either A. C. or D. C., at 110-115 volts, would be most serviceable. The outlet should be flush with the board or wall surface and should be a two-way receptacle.

2. *Window Shades.*—Brilliant quality in motion pictures, depicting details in the highlights and shadows of the picture area, can be shown only in an adequately darkened room. The most satisfactory equipment for the projection of motion pictures should provide for the darkening of the room to the point where it is still possible for pupils to read large print, and so that no direct light falls upon the projection screen. In the usual classroom there are windows on the pupils' left. Generally, these windows are provided with shades, unless the classroom is on the north side of the building. The shades should be of an opaque, not translucent, material. The color of the shade does not matter; however, a light *opaque* shade is preferable to a dark one, on account of pleasing room appearance. The sides of the shades should closely fit the window casings and when drawn up or down should fit closely to the upper casing or windowsill as the case may be. Some schools use an extra shade covering two small windows at once when drawn. A sheath may be provided at the side of this wide curtain so that practically all of the stray light is excluded. This provides a simple, inexpensive means of adequately darkening a classroom.

3. *The Motion-Picture Screen.*—The quality of a projected picture is affected by the nature of the screen from which it is viewed. A poor screen surface will yield most unsatisfactory pictures even from films having beautiful quality. Good pictures cannot be obtained from a fine-

quality screen if it has direct stray light impinging upon its surface. Therefore, in discussing the motion-picture screen we must assume that the photographic print to be used is of the highest quality and that the classroom is properly darkened.

A motion-picture screen for classroom use should be about 4x5 feet in size. It should be inexpensive, should have a fairly high reflecting power and should have a fairly wide angle because of the short distance from the screen of the first few seats at the front of the classroom. The roller type of screen, enclosed in a box so that it will roll up when not in use, will be most serviceable for classrooms in which motion pictures will be shown only once or twice a day.* Such a screen can be hung easily by two screw-eyes from the upper blackboard molding. This also enables it to be taken from room to room and quickly put into position wherever motion pictures are to be shown. The size—4x5 feet—enables a teacher to use lantern slides and the usual lantern slide projector without securing an extra screen. The question of angle is important. If a screen has a very narrow angle, it means that most of the light falling upon it from the projector is reflected directly back toward the projector, and very little to either side of a perpendicular line from the projector to the screen. For instance, with such a screen, a pupil seated at the front extreme left or right side would observe a picture which was brilliant nearest him and shading off in light intensity until the far side would be dim and indistinct. If one should select a screen which would give a picture of equal brilliance no matter from what angle of the room it is viewed, then the picture as a whole would be dull. So, one must choose a screen which has as wide an angle as possible and yet will give a brilliant picture for practically the whole area of the room. Furthermore, portability and cost must be considered.

* A rigid screen is recommended for a room in which motion pictures are shown every period.

4. *The Motion-Picture Projector.*—For classroom use a rugged and simple projector is desirable. Such a projector should be a 16-mm. type, and should be a model which has been approved by the Board of Fire Underwriters. Such projectors do not require booths, licensed operators, extra-heavy electrical wiring or added building insurance. Such approved 16-mm. projectors positively prevent the use of inflammable film because *only Safety film is made in 16-mm. width,* whereas *both inflammable* and *Safety film* are made in the 35-mm. width. So, by using a 16-mm. projector, there is no danger whatsoever from film fire. Such projectors are very simple in operation. Pupils of the upper grades manipulate them easily. These projectors are portable and inexpensive.

5. *Stand for Motion-Picture Projector.*—Most schools have their manual training department build a simple rigid stand for the projectors. Some build these stands from wood, and others from metal piping.

6. *Motion-Picture Library.*—Just as, for instance, a teacher of geography has her sand tables, exhibit cupboards, map cabinets, etc., so the modern classroom teacher has at her disposal the motion-picture films which pertain directly to the classroom instruction in her particular subject. If this film supply is located in the school library, then any classroom teacher in the building can easily and quickly secure the motion picture which she needs for class instruction.

ANOTHER METHOD OF VISUAL INSTRUCTION

Stereoscope and stereopticon equipment in a Mount Vernon, N. Y., classroom. (See article by Superintendent Holmes, page 275.)

LIBRARY-STUDY, HIGH SCHOOL, GREENFIELD, OHIO

Photographs on this page by courtesy of William B. Ittner, Architect, St. Louis, Mo.

LIBRARY-STUDY, HIGH SCHOOL, FORT DODGE, IOWA

MAIN ENTRANCE TO THE BUDER BRANCH LIBRARY, ST. LOUIS, MO.

Combining the School Library and the Public Library

BY ARTHUR E. BOSTWICK

LIBRARIAN, ST. LOUIS PUBLIC LIBRARY

THE necessity of a library as an adjunct to every school is now generally recognized. It is also coming to be accepted, although slowly in some quarters, that this means special quarters and equipment, carefully selected book-stock, and a trained and experienced librarian, giving her whole time to the work and ranking with a teacher of the first class, both in status and salary. The day is past when a school possessing a small and inadequate book-collection, shelved in a corridor or a closet and administered by one busy teacher after another in the intervals of her other duties, could properly say that it had a library.

The Present-Day School Library

A school library is not only a repository of reading matter for pupils; it is an essential part of the school, and its functions have their regular place in the school curriculum. Its use must be taught like the use of any other tool, and then that use must be required by every teacher as part of the school's instructional machinery.

In large schools, the library and its equipment will approximate those required in a university—a large, well-lighted room, filled with reading tables, the walls lined with book-shelves, charging desk, catalog cases, racks for periodicals. Separate adjacent small rooms for office-work and for the storage and handling of books in preparation should be provided. In smaller schools, there should at least be a separate room, not used for any other purpose.

The expense of such a separate library installation, together with the fact that the communities served by many schools have no nearby public library facilities, have suggested in an increasing number of cases the combination of these two uses. The result has been a combined school and public library—the latter usually part of a branch system, although sometimes the main library of a small town.

The Cooperative Administration

The distribution of building expense and administration offers no obstacles in cases where schools and public library are in charge of the same board or public official. It is usual, however, to administer public libraries through a separate board, and here some kind of agreement is necessary. That which is most usual is that the school authorities shall undertake to furnish and care for the quarters, including building and equipment to start with; and to supply heat, light, janitor service, repairs and additional equipment as it may be required. The library authori-

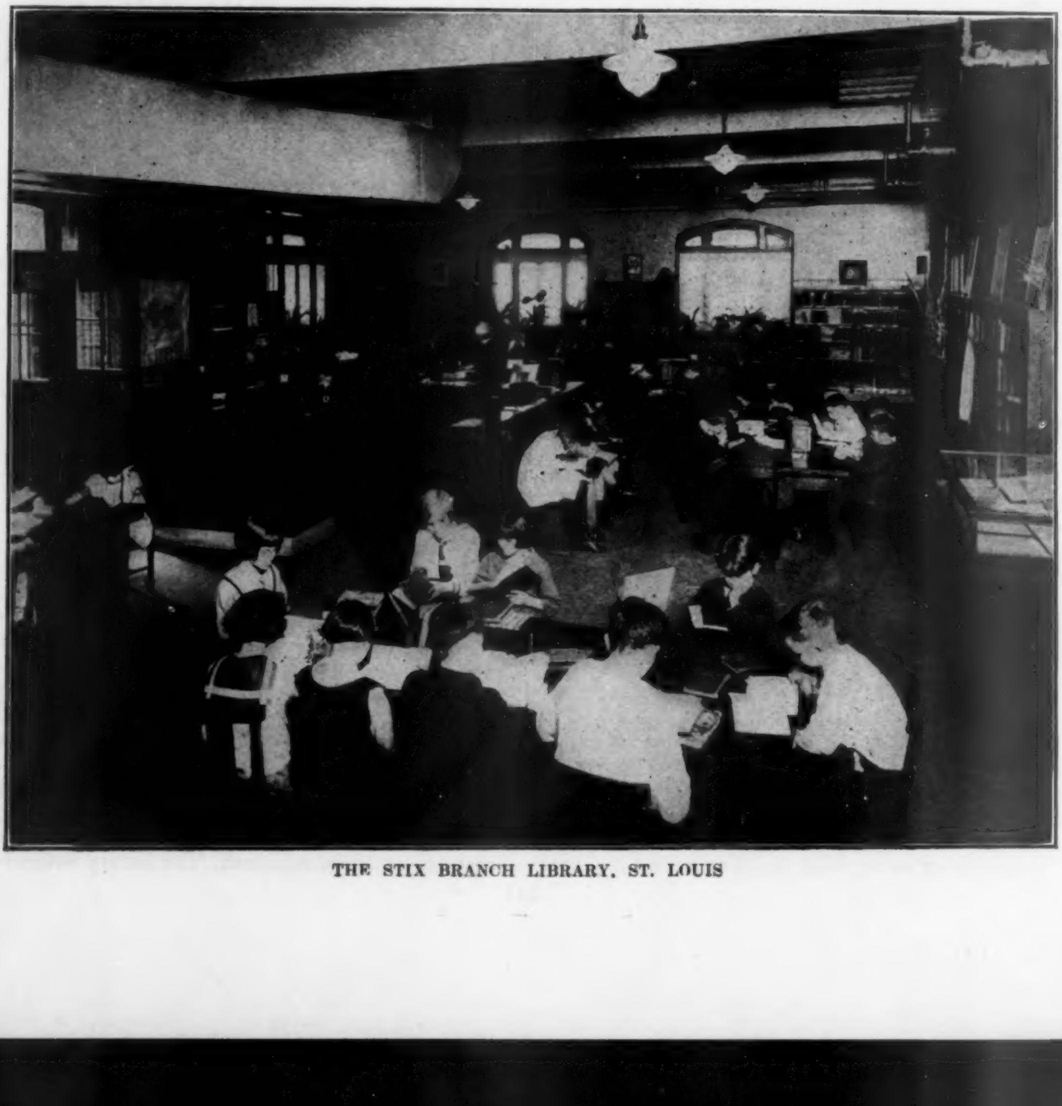
ties, on their part, agree to furnish the initial stock of books, with necessary current additions, to employ a librarian and assistants, and to administer the library in the usual way. The fullest and freest cooperation and interest on the part of the two boards or authorities is absolutely necessary for the success of this plan. Any failure on the part of either may wreck it. The same is true of the employees. Teachers, janitors and librarians must work for its success without jealousy or too minute consideration of matters of jurisdiction.

The fact that a library of this type is intended to perform a dual function affects not only its administration, but the location, arrangement and equipment of its quarters, which must differ in some respects from those of a strictly school library. The library, it must be remembered, is required to function, with respect to the school, as fully as if it had no duties with regard to general community service. At the same time it acts as the public library of the community. The performance of these two functions has been held by some—both teachers and librarians—to be an impossibility, and in fact it has been found that in more than one instance one or the other of them becomes atrophied. The library becomes either an ordinary public library or branch, with little or no connection with the school, except as pupils may use it in their capacity as members of the community, or, on the other hand, it turns into a school library pure and simple—the community, especially its adult members, failing to use it.

Conditions to Be Observed

The complete success of the plan in an increasing number of communities, however, with services equally and satisfactorily divided between these two classes, is an evidence that failure has been due to non-observance of certain conditions of location, equipment and administration. Some of these will now be briefly indicated:

Location.—The quarters of the library must be on the ground floor, preferably on the front of the school building and with an entrance directly from the outside, as well as one communicating with the interior. Non-pupils, especially adults, will not use the library if it is necessary to enter by the main school door, and traverse corridors or climb stairs. This is a matter of practical experience. Except for the fact that it is built into a school building, the library should be as self-contained and as accessible as if it occupied a separate structure.



THE STIX BRANCH LIBRARY, ST. LOUIS

BENTON BRANCH LIBRARY IN ROE SCHOOL, ST. LOUIS

Size.—Most libraries of this type are too small. Designed to perform two functions, they must furnish space for both, although fortunately the greater use of each is at different hours from the other. Too often the school authorities have adopted a grudging attitude, as if the library were an outside enterprise to which they must give up space needed for more legitimate school purposes. Recognition that the library is as necessary a part of the school as the classrooms, the auditorium or the gymnasium, together with willingness to cooperate fully in the dual enterprise that is saving construction costs to the community, will dictate the policy of providing plenty of room at the outset. Roughly, the library should be as large as two to four classrooms, according to the size of the school, with the subsidiary rooms to be indicated below.

Auxiliary Space.—Staff-room, work-room, and toilet-room accommodations are necessary. The last-named need not be separate, if arrangement can be made for the joint use of a room provided for teachers, but in most cases a separate room is best. The work-room must be near the supply entrance of the school to facilitate delivery of books. Staff-room and work-room may be combined if necessary. All of these rooms should be near the library room.

Equipment.—In general, the library room should be equipped precisely like a branch library of the same size. This equipment has become so standardized that it is unnecessary to specify it in detail. All shelving should be on the walls. Most—not all—of the windows should be high, admitting wall shelving beneath them. Space may be gained by building catalog cases and racks into the charging-desk. This should be small and as close as possible to both entrances. If the room can be narrowed at this point and the exterior and interior entrances placed opposite each other, a position directly between them is best for the desk. Windows should be screened in parts of the country where this is necessary. Proximity of the desk to the outside door makes a vestibule necessary. Whether inside or outside, this should be arranged so that, while a protection from the cold in winter, it should not interfere with proper ventilation in summer. A good device is a glazed entryway with doors on the sides, to cut off direct draft, the glass facing the desk being replaceable with a wire screen in summer. The staff-room should have a gas or electric stove, or at least a hot plate, also an ice-box and a couch. The work-room should be shelved for books, have storage space for boxes, a sink with running water (unless the toilet-room is immediately adjacent) and a

practicable work-table, with enameled or glass-covered top.

Light and Heat.—The library, so far as its public use is concerned, will be open during longer hours than the school. In fact, its largest adult use is likely to be in the evening, when the school is closed. There must thus be ample electric light available at such hours. Full heat will be needed when the heat is turned off or lowered through the rest of the building. The school heating-plant must thus be designed and built to this end. Either the library should be served by a separate heater or the heater must be designed to deliver steam or hot water in sufficient quantity to the library when the supply elsewhere is cut off. The former plan obviates the necessity of keeping the main fire up during school vacations.

Obviously, this combination of school-library and public-library cannot always be made. Some schools are too near already-existing libraries to warrant duplication. In some localities the library needs are so great that a separate library building is absolutely necessary. In these cases the library quarters in the school should be built and equipped for school use alone.

A Review of the Current Practice of the Lighting of School Buildings in the United States

BY JAMES E. IVES

PHYSICIST, UNITED STATES PUBLIC HEALTH SERVICE

THIS article presents a review of the current practice of the lighting of school buildings in the United States which was prepared at the request of the committee on lighting legislation of the Illuminating Engineering Society.

Apart from an actual survey of the lighting of school buildings all over the United States, which at the present time is not feasible, it was felt that the best information on this subject could be had by obtaining from the departments of education of all the states and principal cities copies of their codes of requirements for the lighting of schoolrooms. Letters were therefore sent by Surgeon Grover A. Kempf of the Office of Child Hygiene of the United States Public Health Service to the departments of education of the 48 states, and of 12 of the principal cities. Answers were received from 39 of the states and 9 of the cities.

The information supplied in answer to the letters came in the form of lighting rules and codes, building codes, and information contained in letters. This information has been summarized under the following heads:

- Color of walls
- Color of ceiling
- Finish and color of woodwork
- Unilateral or other lighting by windows
- Preferred exposure of windows
- Dimensions of classrooms
- Ratio of window area to floor area
- Type and location of windows:
  - Height of sill
  - Height of ceiling
- Character of shades
- Artificial lighting:
  - Intensity of illumination on desks, recommended or required
  - Watts per square foot
  - Control of lights by switches
  - Exit and emergency lighting
- Inspection and maintenance
- Glare

The information obtained was as follows:

Color of Walls and Ceilings.—Sixteen recommend a choice between one or more of the following colors: light buff, light gray, light yellow, or light green, the preference usually being in the order given. Three recommend brown for the dado, or wainscoting, and one, French gray. A dull finish is recommended in three cases, and in four cases it is specifically recommended that the walls shall not be white. In one case a finish is required having an initial coefficient of reflection of from 0.25 to 0.50.

Color of Ceiling.—Fifteen recommend a choice between one or more of the following colors: cream, ivory white, or white, the preference usually being in the order given. Four recommend that the ceiling shall be of the same color as the walls, but of a lighter shade. Two recommend flat paint; one a neutral color; and one specifies that the color shall not be white—one requires that the ceilings be finished with a matte or semi-matte service having an initial coefficient of reflection of at least 0.70.

Finish and Color of Woodwork.—Only five refer to the finish and color of the woodwork. The individual specifications are as follows: eggshell gloss, dull finish, same color as walls, natural color with a dull surface; and usually dark, but light oak in new schools.

Unilateral or Other Lighting by Windows.—Thirty-one specify unilateral lighting. Fourteen of these permit also windows in the rear. In some cases it is specified that windows in the rear must be at least 6 feet above the floor, and in one case it is specified that no more than 50 per cent of the light shall come from the rear. One states that the windows shall be on the long side only. Other individual cases are as follows: If room is more than 23 feet wide, high windows on right-hand side may be used, at least 6 feet from the floor. Small windows on other sides than the left, placed high, are permissible. High windows on the right side are permissible if they are at least 7 feet above the floor. Unilateral, except when the

THE LIBRARY OF THE NICHOLS INTERMEDIATE SCHOOL, EVANSTON, ILL.

Illustrations by courtesy of Childs & Smith, Architects, Chicago, Ill.

A SOCIAL SCIENCE ROOM OF THE NICHOLS INTERMEDIATE SCHOOL

room is more than 24 feet wide. No skylights unless they are constructed to exclude direct sunlight and excessively bright light from the sky.

Preferred Exposure.—Ten of the states recommend or require that the windows shall have certain exposures. In five cases an east or west exposure for the windows is preferred. In one case it is required. In another case east is preferred, and west is given as second choice. The three other cases are: east or north; east, northeast, northwest, or west; north or southeast; and east or southeast.

Dimensions of Classrooms.—Twenty of the states and cities have requirements as to the length, breadth, and height of classrooms. There is some agreement as to the height of the ceiling, nine of them specifying that it shall not be less than 12 feet. In four cases a width of room of 23 feet is specified. Usually the width and length are specified in combination with each other, and sometimes the ratio of length to width is given. The individual cases are given in the following table:

than 1 to 5 if the windows are on the left only, and not less than 1 to 4 if the windows are on the left and rear.

Height of Window Sill from the Floor.—This is specified in nineteen cases. The least permissible height varies in individual cases from 2 feet 6 inches to 4 feet. In three cases a height of 3 feet is specified, in two cases 3 feet 6 inches, and in two cases, 4 feet. In one case a height of not less than 2 feet 6 inches is specified, but 3 feet to 3 feet 6 inches is recommended for grades above the fourth. In another case, not less than 3 feet 2 inches nor more than 3 feet 6 inches, except in special cases, is specified. In other cases values are given as the least values permissible.

Distance from Top of Window to Ceiling.—This distance is mentioned in twenty-one cases and varies from "a distance as near to the ceiling as possible," to "a distance of 18 inches for a ceiling 14 feet high." In five cases it is stated that it should not be more than 6 inches; in four cases not more than 1 inch. In one case the least distance is made to depend upon the height of the

REQUIREMENTS OF 20 STATES, OR LARGE CITIES, AS TO DIMENSIONS OF CLASSROOMS

	Width	Length	Ratio of Length to Width	Height of Ceiling	Ratio of Width of Room to Height of Top of Window Above the Floor
(1)	18 feet 8 inches to 21 feet 10 inches	27 feet 4 inches to 31 feet 4 inches			
(2)	Not greater than 24 feet	Not greater than 32 feet		Not less than 12 feet	
(3)	23 feet	31 feet			
(4)				11 to 14 feet	
(5)	23 feet	Not greater than 32 feet	$\frac{4}{3}$		
(6)	23 feet			12 feet	
(7)					Not more than 2⅓
(8)				Not less than 12 feet	Not more than 2
(9)					Do.
(10)			$\frac{5}{4}$ or $\frac{3}{2}$		
(11)				12 feet	
(12)	19 to 22 feet	24 feet 6 inches to 30 feet		11 feet 3 inches to 12 feet	Do.
(13)	21 feet	23 to 27 feet		12 feet	
(14)					Top of window shall be at height above floor equal to one-half width of room minus 8 inches
(15)	23 feet	30 feet		Not less than 12 feet	
	Or 24 feet	32 feet		do.	
(16)	23 feet	30 feet		do.	
(17)				do.	
(18)	22 feet	28 feet		do.	
(19)					Not more than 2, except in very wide rooms, when light must be distributed by other means
(20)	23 feet	32 feet			

Ratio of Window Area to Floor Area.—The least permissible ratio of window area to floor area is specified in 32 cases. In one case it is specified that the ratio shall not be less than 1 to 4; in twenty-one cases, not less than 1 to 5; in six cases, not less than 1 to 6; and in one case, not less than 1 to 7. In one case it is specified that in general the ratio must not be less than 1 to 5, but that when the light is from the north, the ratio must be not less than 1 to 4. In another case it is specified that it must not be less

ceiling, 1 inch if the ceiling is from 11 to 12 feet high, and 18 inches if the ceiling is from 13 to 14 feet high. In one case it is specified that window heads shall not be less than 11 feet 4 inches above the floor, and that there shall be less than 12 inches from the top of the glass to the ceiling.

Character of Window Shades.—The character of window shades is specified in seventeen cases —translucent shades are specified in twelve cases. Double rollers are specified in five cases. The colors recommended are very variable, white, ecru,

blue, gray, slate, buff, tan, champagne, neutral, cream, straw, etc. In two cases it is stated that the shade should be adjustable both from the top and bottom of the window. In two cases a choice is given between two shades adjustable at middle of the window, or a single roller with patent adjustable fixtures. In one case a translucent shade which rolls from the top down and a heavy dark shade (green) which rolls from the bottom up is recommended. In one case it is stated that the color of the shades must harmonize with the color of the walls.

Intensity of Artificial Illumination on Desks.—In only seven cases is the least permissible intensity of the illumination on the desks specified. The values given range from 3 to 8 foot-candles, the individual values being 3, 3.41, 4-7, 5, 6, and 5 required and 8 recommended.

Least Watts per Square Foot of Floor Area.—This quantity is specified in only four cases, the values given being 0.9, 1.1 to 1.3, 1.25, and about 1.74.

Control of Light by Switches.—This is specified in four cases, as follows: Switches should be at points of entrance. Switching and controlling apparatus should be installed at entrance to classrooms, hallways, etc.—one switch for lights next to corridor and one for lights next to windows. Switching or controlling apparatus should be so arranged at entrance to each room that a portion of the lights of the room may be turned on.

Exit and Emergency Lighting.—This is specified in four cases, as follows: corridors, stairways, and egresses shall be suitably lighted and there shall be a suitable number of emergency lights. Emergency lights should be placed at main stairways and exits. Exit lights should be used for halls and gymnasiums. Electric emergency lighting should be supplied from an independent connection extending back to main service entrance, and in every building used at night a red light shall be placed over every emergency exit door, and over every exit door where other doors may cause confusion.

Inspection and Maintenance.—There were only three references under this head, viz.: Walls must be kept clean. All parts of lighting system should be frequently inspected and properly maintained. All parts of system should be frequently inspected and defective parts replaced or repaired. Windows should be frequently washed, walls and ceilings washed or redecorated periodically.

Glare.—Provisions against glare occur in eighteen cases. They deal with the character and position of blackboards, the nature and position of lighting units, and the distance from the front wall of the room to the first window. The most important provisions specified are:

1. Blackboards shall be non-reflecting.
2. Blackboards shall be placed in front (behind the teacher's desk) and upon walls on the right-hand side of the classroom.
3. Lights should be shaded and placed well out of the ordinary range of vision.
4. There should be a distance of from 4 to 8 feet from the front wall of the room to the first window on the left-hand side of the classroom.

This last important specification is made in nine cases. In one case it is stated that it is desirable that artificial lighting should have the same general direction as natural lighting; that is, from the left and slightly from the rear.

It will be noted that there is a great divergence among the different states and cities of the Union as to their requirements for natural and artificial lighting of schoolrooms. It is evident that these requirements should be standardized as far as possible. Most of these requirements are discussed in the American Standard Code of Lighting School Buildings, prepared and issued by the Illuminating Engineering Society and the American Institute of Architects in 1924, and the requirements of this code might logically be made the requirements of the individual states and cities. Since most of the schools in the United States have no provision for artificial lighting and are only occupied in the daytime, provisions for the proper day lighting of schools are more important at the present time than those for artificial lighting. However, as schools become used more and more in the evening for instructional and social purposes, the artificial lighting of schools will become more and more important.

EDITORIAL NOTE—The foregoing article is reprinted, by permission, from *Public Health Reports* for December 14, 1928.

See also "Practical Suggestions on the Artificial Lighting of School Buildings," by A. L. Powell, Illuminating Engineer, pages 37-42, in The American School and University for 1928-1929.

Open-Air Classes and Schools

BY HUGH GRANT ROWELL, M.D.

Assistant Professor of Health Education, Physician to the Horace Mann Schools, Teachers College, Columbia University

TO the large majority of school executives and school architects, open-air schools are an educational curiosity, nor is their purpose or organization and administration any too clearly comprehended.

In every school system there are physically handicapped pupils who must be educated, at least part of the time, in special classes, if they are to receive as good an education as they deserve and if they are to be educated without slowing down the progress in the average classroom. The best-known groups of handicapped children in public schools are the semi-blind; the deafened or hard of hearing; and what may be called the tuberculosis-prevention children. The last term is meant to include the malnourished, pretuberculars, arrested tuberculars, certain convalescents from long and debilitating illnesses and others. Associated in classes with the latter group are found cardiacs in many cities, since cardiacs accept successfully the same régime as the nutrition groups.

The classes for the tuberculosis-prevention group of pupils (and incidentally cardiacs in some cities) are called by various names, open-air and fresh-air classes and schools being some of the terms. These classes are the most popular type of project for physically handicapped children, as shown by the studies of Ayer[1] and others. Wood and Rowell[2] have summarized and brought up to date books and pamphlets by Rapeer, MacDonald, Wedgewood, Leonard Ayres, and others. The contemporary health and educational magazines teem with enthusiastically worded reports of various classes now under way. For such materials the reader is referred to the standard literary and specialized indices.

The fresh-air movement began in 1904 in Charlottenburg, a suburb of Berlin, Germany, when an "Open-Air Recovery School" was instituted to give children who were physically debilitated opportunity to improve mind and body simultaneously. Other towns in Germany rapidly adopted the project. Similar schools were instituted in England in 1907. In 1908, Providence, R. I., began the first such school in the United States, followed the next year by a "School of Outdoor Life" in one of the Boston, Mass., parks.

Various Types of Fresh-Air Projects

In New York City fresh-air classes are grouped effectively under three heads:

1. Outdoor classes for pulmonary tuberculosis cases, located at day camps and sanatoria
2. Open-air classes for tuberculosis contacts, arrested cases of tuberculosis, malnutrition cases, sufferers from certain nervous diseases, children frequently absent on account of respiratory infections, cardiacs, etc.;
3. Open-window classes for normal pupils, where room is kept from 50 to 65 degrees temperature.

There is a present tendency in the New York City schools to look with more or less disfavor on such special classes, chiefly as the result of the report of certain professional groups who were asked to investigate these projects.

The details of program and organization and administration of the various special types of fresh-air projects are to be found in Wood and Rowell,[3] to which the reader is referred. Summarized, certain general principles stand out through all these schools and classes:

General Principles Summarized

1. Through open windows or even through actually holding the class in the open, the classroom temperature is kept at about that of the outdoors, except in extremely cold weather. Provision has to be made for a warm room into which pupils can go, lest they be chilled through over-exposure to cold. There is now a general feeling that too low a temperature for such classes is not conducive to proper physical improvement, and this must be remembered in handling them.

2. Extra clothing is needed for the pupils and teachers. This may take the form of sweaters, overcoats, felt boots, remembering that unless the feet are kept warm, it is useless to try to keep the individual comfortable. In the roof class of the Horace Mann School, Teachers College, Columbia University, the parka, used by Arctic explorers, and felt boots, are the approved costume. Clothing must be as light and flexible as possible, in order to permit freedom of movement.

3. The program of the day differs in several ways from that of the regular classroom:

(a) There are one or more rest periods, when the children are permitted to lie upon cots, each child having his own blanket.

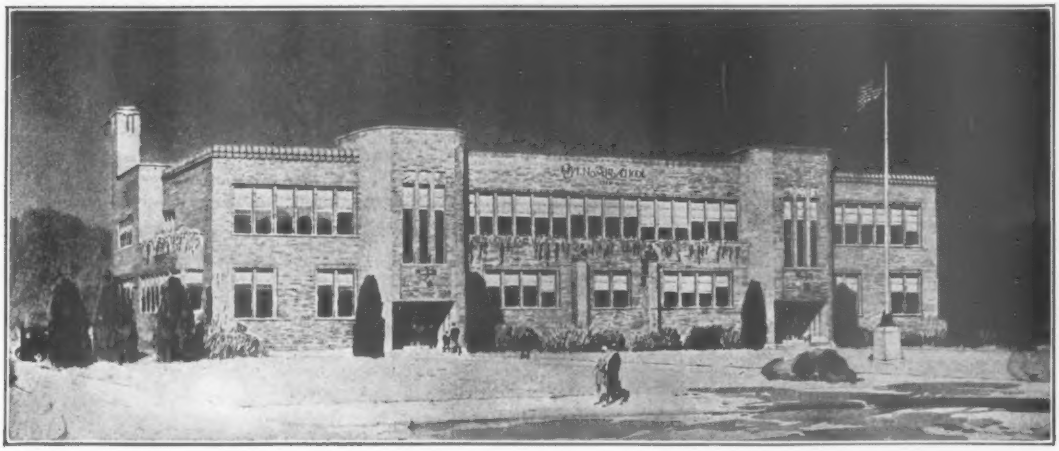
(b) Physical education activities are in keeping with the pupils' general condition, which is, in many instances, subnormal.

(c) There is some sort of feeding program, varying from a mid-morning milk lunch to several meals of rather liberal proportions. Experience has shown that parents of malnourished

[1] Ayer, F.: Questionnaire to a Selected Group of City School Superintendents.—*American School Board Journal*, April, 1923.

[2] Wood, Thomas D., and Rowell, Hugh Grant: Health Supervision and Medical Inspection of Schools, Philadelphia.—W. B. Saunders Co., 1927.

[3] Wood, Thomas D., and Rowell, Hugh Grant, *loc. cit.*



Simpson & Rolston, Inc., Architects and Engineers

FIG. 1. ARCHITECT'S SKETCH OF PROPOSED OPEN-AIR SCHOOL, NEWARK, N. J.

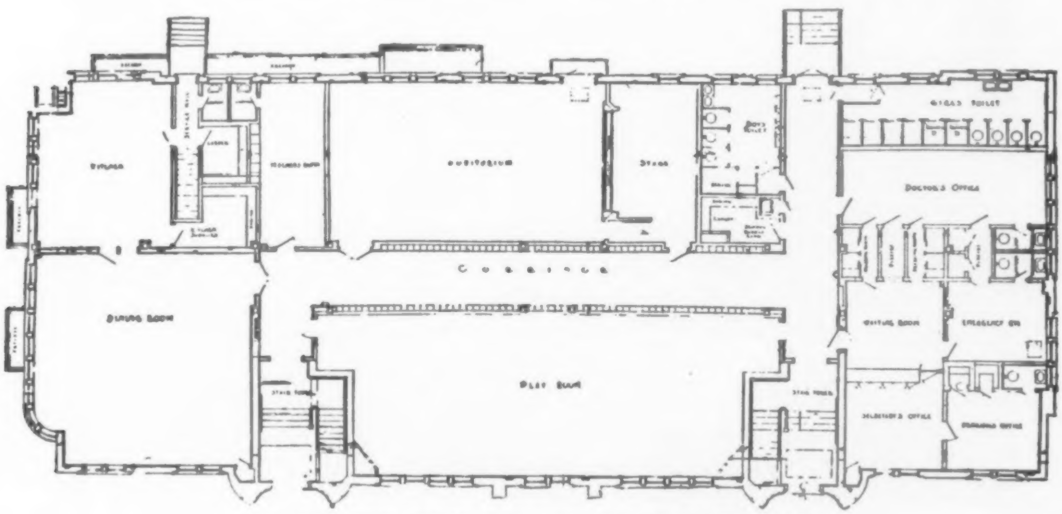


FIG. 2A. FIRST FLOOR PLAN, NEWARK OPEN-AIR SCHOOL

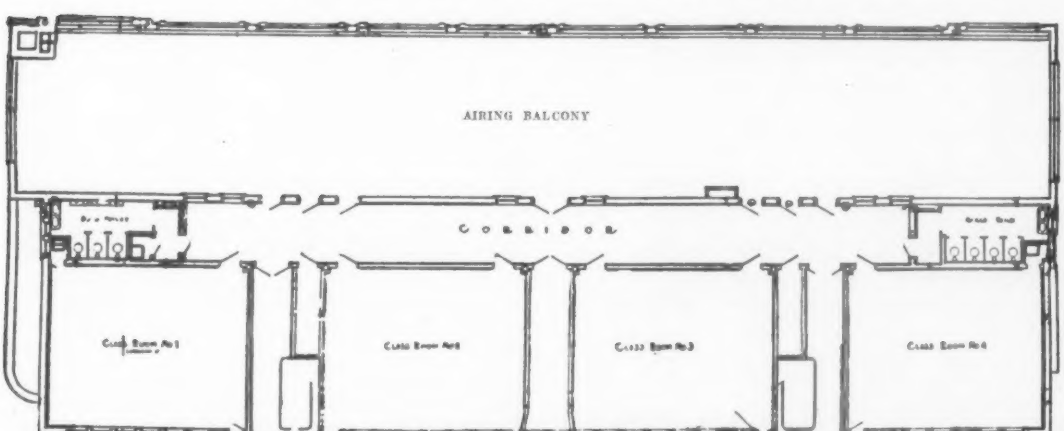


FIG. 2B. SECOND FLOOR PLAN, NEWARK OPEN-AIR SCHOOL

children frequently exploit them during the noon hour by having them carry the father's lunch to the mill or other work, so that the child arrives at school exhausted and fit only to rest during the afternoon session. For this reason, as well as others, a hot noon lunch must be provided, and the child kept at school.

4. Since these classes are organized primarily as health classes, any attempts to push the pupils educationally at the expense of health are not in keeping with the purpose of the class. Certain pupils, however, may actually improve in classroom work as a result of improved physical condition, resulting from the new and healthful régime. Teachers must be impressed with the fact that "keeping up to grade" is at best of secondary importance. In all probability any progress lost will be only temporary and substantial gain educationally will be shown in future years, as a result of increased physical assets.

5. General physical condition of pupils is watched more carefully than in ordinary classes by:

(a) Unusually comprehensive physical examinations before admission and at frequent intervals thereafter.

(b) Weighing at least every week, weight progress, whether positive or negative, being an excellent criterion of physical improvement in pupils in these groups.

(c) Taking of temperature of child regularly. In many cases this is done daily.

(d) Sundry special attentions from the school health service and the teacher, in addition to services previously noted.

6. The teacher is usually paid on a higher scale than the average classroom teacher. She must possess unusual personality and professional qualifications. Until the very recent program for training such teachers was developed at Teachers College, Columbia University, it had been necessary for teachers of fresh-air classes to do the best they could with what information they could pick up from the literature and from older teachers in the same field. At present a cooperative arrangement between Teachers College and the National Health Council, represented by the National Tuberculosis Association, makes possible definite training for teachers and supervisors of fresh-air classes. This is part of the program for teachers and supervisors of special classes for physically handicapped children. Sanatarium classes are often placed in charge of teachers assigned from public school systems. Obviously, educational progress must be slow and entirely individual for the sanatorium child.

FIG. 3. REST PERIOD IN THE LAPHAM PARK OPEN-AIR SCHOOL, MILWAUKEE, WIS.

Certain private schools, such as the Horace Mann School, already mentioned, have fresh-air classes. On enrollment, there is really little difference mentally or physically between such groups and children in inside classrooms. Places are offered to parents for children who might benefit especially from an outdoor régime, or to those who are especially appreciative of the privileges offered by such special classes. Some parents are much prejudiced against such classes, for various reasons. Morbidity from respiratory diseases seems to be somewhat lower in outdoor classes, though no really objective study is available for proof. Studies are now being made of the educational and physical progress of indoor versus outdoor children in the Horace Mann School. A previous study was favorable to the outdoor group.

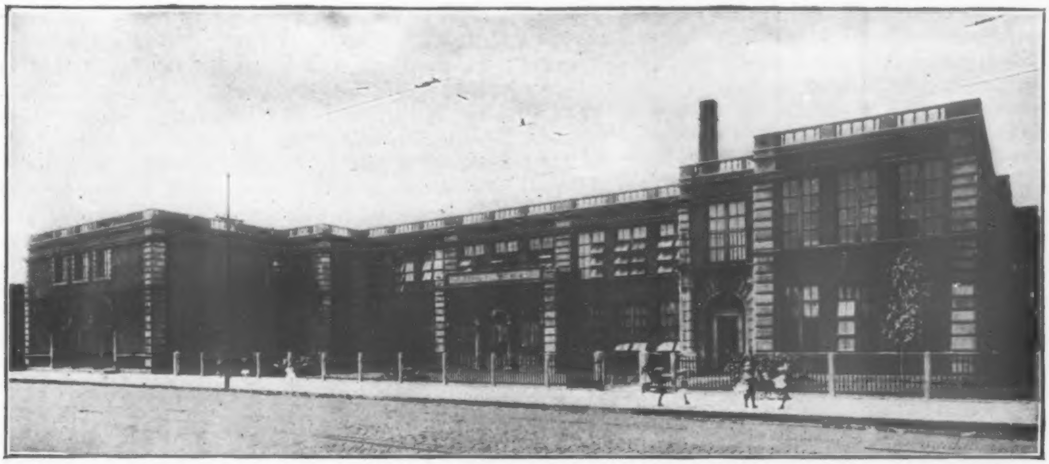


FIG. 4. J. N. THORPE SCHOOL, CHICAGO, ILL., SHOWING OPEN-AIR ROOMS EQUIPPED WITH DONOVAN WINDOWS

Fundamentals of Construction

From a construction point of view, it is possible to make various provisions for fresh-air classes. The building of the preventorium, really an institution, need not be discussed here. Ample information on this subject is available from the National Tuberculosis Association, 370 Seventh Avenue, New York.

From the point of view of the public school, there are two possibilities for housing these classes:

1. *Separate Buildings.*—These disfigure the lot and, in the words of a famous Mayor, look like little "warts all over the grounds." Portable school buildings of standard type may be used. The preferred type would be one-room buildings, having a blackboard on one end, full windows on the left of the pupils, and high windows on the right, thus giving cross-ventilation and correct lighting. In Massachusetts, the "Monitor" type of building has been favored, the feature being a ventilator extending the full length of the ridgepole. The awning type of windows (described below) may be used successfully in these portable or small buildings. Locations must be free from dust and noise, such as are found on streets with heavy traffic.

The possibilities of larger buildings for open-air classes may be realized strikingly in the new school proposed for Newark, N. J. (Fig. 1). This building, designed for children of that city who are tubercular, will contain academic classrooms and open-air resting and sleeping balconies the full length of the school. Cots and blankets will be provided for the children. Special facilities will include play rooms, small auditorium with moving-picture facilities, office, medical rooms, sanitary kitchen and lunch-room, incinerator, laundry, etc. Portions of the blueprints are shown in Figs. 2a and 2b. (Courtesy of Cephas I. Shirley, Business Manager, Board of Education, Newark, N. J.)

2. *Special Rooms in Standard Buildings.*—Cincinnati has such rooms.

Whether special rooms or special buildings are used, certain fundamentals must be provided:

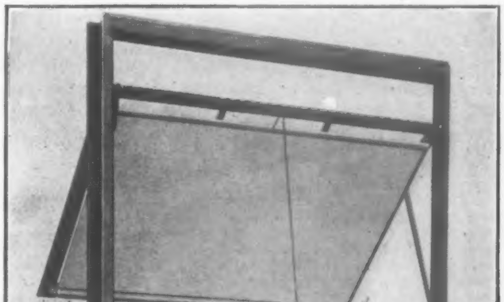


FIG. 5. AWNING TYPE DONOVAN WINDOW WITH SHADES

Inside view—all vents open

1. *Fresh Air.*—T. B. Kidner, formerly consultant on institutional planning to the National Tuberculosis Association, and a leading authority on the architecture of fresh-air classrooms and schools, as well as preventoria, favors the Donovan window (Fig. 5), placed as noted above in description of buildings. The Donovan * window has the advantages of opening outward, thus avoiding obstructions in the room. Through the specially adjustable shades, it is possible to regulate the natural lighting of the room to avoid glare. The possibility of using the lowest part of the window as a separately acting unit is of great advantage in inclement weather. The cost is slightly greater than that of double-hung windows. Conceivably, the window-gravity or Wheeler system of natural ventilation is also effective in fresh-air rooms, if cold floors can be avoided. It is very doubtful if artificial ventilation systems can meet the need of these special classes, and Mr. Kidner states that they cannot do so. According to him, natural ventilation only is suitable for fresh-air classes.

2. *Means of Avoiding Chilling.*—Mr. Kidner suggests that a single floor under which heat pipes are laid is very effective, inasmuch as the pupils' feet will thus be warmed and it is much easier for the child to stand low temperatures if his feet are kept comfortable. To carry out this plan in a new building would not be expensive, nor would the cost of such installation in an old building be prohibitive.

* The writer realizes that, in mentioning favorably a patented window, he places himself in the position of apparently advertising, in a thinly disguised manner, a product which must be obtained exclusively from one source. However, the real intention of the writer is to present certain desirable features in window construction, viz., opening outward and thus avoiding obstruction in the room, good ventilation possibilities with special control of the lowest portion of the window, combination of glare-avoiding shading with the window by means of a simple and apparently practicable device. In constructing open-air rooms, the school official or architect should always study the merits of various types of windows and select the one which gives the best value in terms of money costs and service rendered. Very often it is possible to obtain the major merits of a patented device quite inexpensively if sufficient time and ingenuity are used. The writer wishes to acknowledge the courtesy and interest of the Truscon Steel Company in making available for him models and literature on the Donovan window, also for permission to use certain illustrations found in this article.

Importance of Proper Organization and Administration

In the main, the success of the fresh-air class is not dependent upon any expensive special physical equipment. The ventilation requirements are no more than should be available (but usually are not) in any good school building. It is quite possible to keep the pupils warm enough by the various methods noted through this article. The crux of the whole matter lies in proper organization and administration. The children must be properly selected and adequately cared for following admission. A suitable routine for the day must be developed. Plans must be carried out with accuracy and nicety. Field observation of many fresh-air classes has led visitors to believe that they are at present, too frequently, very badly run. The teachers are not carrying out the program as planned; the mental hygiene in many classes is bad; and the teachers themselves are not at all clear as to their duties or the basic purposes of the classes. The answer is in better-trained teachers and better-trained and more observant supervisors.

In general, fresh-air classes offer two main possibilities:
(1) Unusually favorable conditions for debilitated children; results have been remarkably good with such groups. (2) Most favorable conditions for mental and physical welfare for normal children. That such children would not show the striking physical progress made by the debilitated is not surprising, since those who need the privileges most will gain most from them as a rule. Nevertheless, in the opinion of the writer, the privileges of a fresh-air class are, to any child, markedly favorable to the retention of good health and the building-up of a physical reserve. This is especially true in these days when it must be admitted frankly that most school buildings are anything but models of good ventilation,* and, in the words of a great sanitarian, "We need to bring fresh air back to the lungs of school children."

* For a discussion of Current School Ventilation Practice in Typical American Cities, by Thomas J. Duffield, Executive Secretary, New York Commission on Ventilation, see THE AMERICAN SCHOOL AND UNIVERSITY for 1928-1929, pages 45-53.

Sixteen Significant Books on Developing School-Building Programs and Planning School Buildings

BY RAY L. HAMON

FORMERLY DIRECTOR OF SCHOOL-BUILDING CONSTRUCTION, DADE COUNTY, FLORIDA

ALT, HAROLD L.—Mechanical Equipment of School Buildings. Bruce Publishing Company, Milwaukee, Wis., 1916. 108 pp.

Includes 160 charts illustrating the installation of mechanical equipment, plumbing lines, steam lines, ventilation ducts, and wiring.

BRUCE, WILLIAM GEORGE.—High School Buildings. Vol. II. Bruce Publishing Company, Milwaukee, Wis., 1919. 320 pp.

Plans and photographs of high school buildings and articles dealing with school architecture.

BRUCE, WILLIAM GEORGE.—Grade School Buildings. Book II. Bruce Publishing Company, Milwaukee, Wis., 1925. 400 pp.

Plans and photographs of grade school buildings and article on school architecture.

COOPER, F. I.—Report of National Education Association Committee on School House Planning. National Education Association, Washington, D. C., 1925.

The report was made under the auspices of the National Education Association in cooperation with the National Association of Public School Business Officials, American Society of Heating and Ventilating Engineers and National Fire Protection Association, by a committee of twelve members and ten associate members. It contains 164 pages with 59 charts and proposes standards for school buildings.

DONOVAN, JOHN J., AND OTHERS.—School Architecture, Principles and Practices. Macmillan Company, 1921. xix + 711 pp.

Includes 669 cuts of school-building plans and photographs. This is a very comprehensive work on school architecture by three architects, three engineers and thirteen educators. It covers the fields of sites, landscaping, buildings, special departments, service systems and equipment.

DRESSLAR, F. B.—American School Buildings. United States Bureau of Education Bulletin, 1924, No. 17.

ix + 98 pages + 45 plates of school-building plans and photographs. This bulletin contains a discussion and illustrations of planning school plants, including sites, buildings, special rooms, service systems and equipment. Also see American Schoolhouses and Rural Schoolhouses and Grounds, United States Bureau of Education, Bulletin 1910, No. 5, and 1914, No. 12, by the same author.

ENGELHARDT, N. L.—School-Building Programs in American Cities. Bureau of Publications, Teachers College, Columbia University, New York City, 1928. x + 550 pp.

Includes 127 maps, 119 tables, 23 charts and 70 illustrations. This is a comprehensive treatment of the techniques employed in forecasting population, determining plant needs, and locating buildings. The volume contains criticisms of school-building plans and types of construction. Data have been used from the surveys of Lynn, Mass., Watertown, N. Y., Fort Lee, N. J., Paducah, Ky., Greensboro, N. C., Augusta, Ga., Jacksonville, Fla., Beaumont, Texas, and Rye, N. Y.

HART, FRANK W.—A Standard State Schoolhousing Code. C. F. Williams & Son, Inc., Albany, N. Y., 1924. 172 pp.

Includes a proposed state school-building code, checking lists for plans and specifications and present state control of school buildings. This work is especially valuable to the building divisions of state departments of education and is also of value to county and city systems.

High-School Buildings and Grounds. A Report of the Commission on the Reorganization of Secondary Education, appointed by the National Education Association. United States Bureau of Education, Bulletin 1922, No. 23.

xi + 49 pages. An illustrated discussion of elements common to all schools, architecture, the component parts of the secondary school plant, interior finish and equipment.

MILLS, WILBUR T.—American School Building Standards. Franklin Educational Publishing Company, Columbus, Ohio., 1915. 598 pp.

Includes plans and photographs of school buildings and detailed discussions. This volume represented a distinct step in the evolution of American school architecture.

STRAYER, GEORGE D., AND ENGELHARDT, N. L.—School-Building Problems. Bureau of Publications, Teachers College, Columbia University, New York City, 1927. 688 pp.

Includes 129 diagrams, 57 tables and 20 illustrations. This book is a case study and presents 109 problems dealing with population studies, locating new buildings, utilization of buildings, school-building programs, the architect, plans and specifications, contracts, construction, planning school buildings, service facilities, planning special rooms, equipment, costs, financing, insurance, and publicity.

STRAYER, GEORGE D., AND ENGELHARDT, N. L.—Standards for Elementary School Buildings. Bureau of Publications, Teachers College, Columbia University, New York City, 1923. 57 pp.

Includes 7 tables and 3 charts. This booklet contains a discussion of standards which should be observed when planning elementary school buildings, also directions for using the Strayer-Engelhardt Score Card for Elementary School Buildings.

STRAYER, GEORGE D., AND ENGELHARDT, N. L.—Standards for High School Buildings. Bureau of Publications, Teachers College, Columbia University, New York City, 1924. 89 pp.

Includes 6 tables and 12 diagrams. This booklet contains a discussion of standards which should be observed when planning high school buildings, also directions for using the Strayer-Engelhardt Score Card for High School Buildings.

THE AMERICAN SCHOOL AND UNIVERSITY.—American School Publishing Corporation, 443 Fourth Avenue, New York City, 1928.

This volume contains 383 pages. It is an illustrated encyclopedia of the educational plant. Fifty-four different authors, each a specialist, have contributed to its content. The principal sections are: Planning and Construction of Educational Buildings; Utilization and Maintenance of Buildings and Grounds; Physical Education Facilities; Educational Equipment and Supplies; Special-Department Layouts; Directory of Architects for Educational Buildings; Chemical Index; and Lists of Manufacturers and Distributors.

THOMAS, MINOR W.—Public School Plumbing Equipment. Bureau of Publications, Teachers College, Columbia University, New York City, 1928. 128 pp.

Includes 6 charts and 7 tables. This book is the standard in the field of plumbing fixtures for school buildings as to number, arrangement and quality.

Ventilation. Report of the New York State Commission on Ventilation. E. P. Dutton and Company, New York City, 1923. xxvi + 606 pp.

Includes 266 tables and 134 charts. This is a comprehensive report of a most thorough research on ventilation.

EQUIPMENT FOR THE ADMINISTRATIVE OFFICE

FILING EQUIPMENT FOR EVERY PURPOSE

ART METAL STEEL FILES—Upright unit vertical files are carried in stock for every standard size of record. Units are from one to five drawers high and may be had in two depths—24 and 28 inches. All units are finished with special enamels in rich olive green or natural wood finishes.

ART METAL MONO-DRY INSULATED FIRE-SAFES have the Underwriters' Laboratories highest ratings, and bear the labels A T-20 and B T-20. The protection of Art Metal fire-safes is permanent because the insulation is dry.

CLASS A T-20 FIRE SAFE

ART METAL STEEL DESKS are strongly built with trim, clean lines. There are fifty-five styles in handsome plain or grained finishes.

ART METAL STEEL DESK

A COMPLETE LINE OF STEEL OFFICE EQUIPMENT

Standard lines of desks, files, safes, shelving and office partitions provide a wide range of choice. Three lines of steel desks and tables, many styles of filing equipment, three classes of fire-resisting safes, provide office equipment facilities for any school requirements.

Write for any of these catalog booklets:

1. OFFICE DESKS
2. STEEL SHELVING
3. HORIZONTAL SECTIONAL FILES
4. PLAN-FILES
5. FIRE-SAFES
6. UPRIGHT UNIT FILES
7. COUNTER FILES
8. POSTINDEX VISIBLE FILES
9. SECTIONAL STEEL PARTITIONS

Art Metal Steel Shelving and Storage Cabinets for the Storeroom

ART METAL STORAGE CASES AND WARDROBES ARE SUPPLIED IN SIX CONVENIENT, READY-BUILT STYLES

ART METAL STEEL SHELVING (enamel finish) comes with or without backs, doors or sides—adjustable to any storage purpose. This type of shelving fits any space, and is used for many purposes. It gives the largest possible storage capacity per cubic foot occupied.

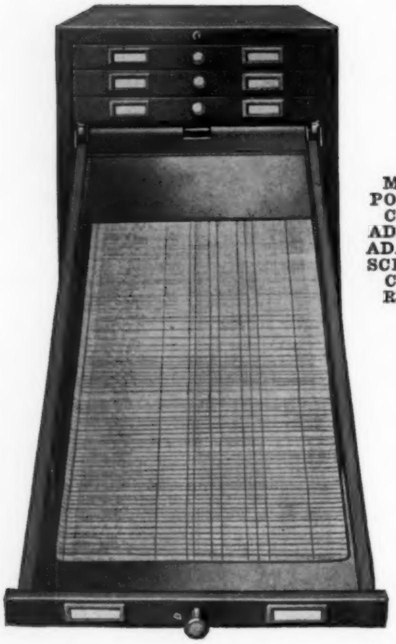
ART METAL STEEL SHELVING is easily ordered, easily erected, and can be taken down or rearranged without depreciation. It often costs less than wood. Art Metal also makes a complete line of assembled steel wardrobes and storage cases for various purposes.

ART METAL STEEL SHELVING IS PERMANENT, FIRE-RESISTING AND ECONOMICAL, AND BUILT TO SUSTAIN HEAVY LOADS

POSTINDEX COMPANY, INC.

A DIVISION OF THE ART METAL CONSTRUCTION CO.

JAMESTOWN, NEW YORK



MODEL 8, POSTINDEX CABINET ADMIRABLY ADAPTED TO SCHOOL AND COLLEGE RECORDS

POSTINDEX IDEAL FOR SCHOOL RECORDS

Among the advantages of Postindex Visible Filing Equipment for school records are greatly increased speed in posting and reference; . . . clerks' and teachers' time saved; elimination of misfiling or losing cards. Posting is done without removing the record from the file.

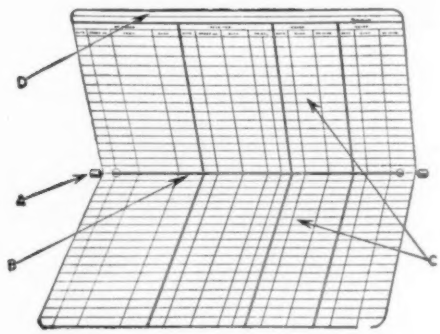
Postindex offers the security of a bound book with the flexibility of a card filing system. Postindex records have the added advantage of being visibly indexed. The unique four-page Postindex form provides ample capacity for cumulative scholastic and attendance records of the student, from kindergarten through High School, or from his matriculation as a college freshman to his graduation.

Postindex cabinets and Postindex forms are ideally adapted to school records. Postindex offers well organized systems for handling individual school records and central file records. Student's history records, health records, vocational and opportunity records, accounting and personnel records are well suited to Postindex.

Write for a copy of "Equipment for Better Control of Facts and Figures."

We shall be glad to send you samples of school records or to submit a proposal for a complete record keeping system.

4 SIDES TO WRITE ON



FEATURES OF THE POSTINDEX FORM

A.—Trunnion operating in channels of each side of panel.
B.—Spring wire that permits form to be snapped in and out of panel at will.
C.—Two pages of 4-page form shown. Entire writing area on an 8 x 5 in. form of 160 square inches is equal to that on a 10 x 16 in. ledger page.
D.—Visible line showing where name and address of account or title of record is typed.

MANY SCHOOLS AND COLLEGES USE POSTINDEX FILES

The following are a few of the schools and colleges using Postindex equipment:

Baltimore Public Schools, Boston University, Bucknell University, Chicago Board of Education; Choate School, Wallingford, Conn.; Colgate University; College of the Holy Cross; College of St. Francis Xavier, New York City; Harvard College; Harvard University School of Business; Massachusetts Agricultural College, Amherst, Mass.; Mass. Inst. of Technology, New York Board of Education, New York City; N. H. Board of Education, New Haven, Conn.; Northeastern University; Radcliffe College, Simmons College, Boston; St. John's Preparatory School, Danvers, Mass.; University of State of N. Y., Albany, N. Y.; University of Maine; University of Michigan; University of Idaho, University of Illinois.

GRAYBAR ELECTRIC COMPANY

Successors to Supply Department of
WESTERN ELECTRIC COMPANY

Executive Office: Graybar Building, Lexington Ave. and 43rd Street
NEW YORK, N. Y.

GraybaR
ELECTRIC COMPANY
Successor to *Western Electric* Supply Dept.

Akron, Ohio
Albany, N. Y.
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Baltimore, Md.
Beaumont, Texas
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Boston, Mass.
Brooklyn, N. Y.
Buffalo, N. Y.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Dallas, Texas
Davenport, Iowa
Dayton, Ohio
Denver, Colo.
Detroit, Mich.
Duluth, Minn.
Flint, Mich.
Ft. Wayne, Ind.
Ft. Worth, Texas
Grand Rapids, Mich.
Hammond, Ind.
Harrisburg, Pa.
Hartford, Conn.
Houston, Texas
Indianapolis, Ind.
Jacksonville, Fla.
Kansas City, Mo.
Knoxville, Tenn.
Los Angeles, Calif.
Memphis, Tenn.
Miami, Fla.
Milwaukee, Wis.
Minneapolis, Minn.
Mt. Vernon, N. Y.
Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Newark, N. J.
Norfolk, Va.
Oakland, Calif.
Oklahoma City, Okla.
Omaha, Nebr.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Providence, R. I.
Reading, Pa.
Richmond, Va.
Roanoke, Va.
Rochester, N. Y.
St. Louis, Mo.
St. Paul, Minn.
Salt Lake City, Utah
San Antonio, Texas
San Francisco, Calif.
Savannah, Ga.
Seattle, Wash.
Spokane, Wash.
Syracuse, N. Y.
Tacoma, Wash.
Tampa, Fla.
Toledo, Ohio
Trenton, N. J.
Wichita, Kan.
Worcester, Mass.
Youngstown, Ohio

Graybar Inter-Phones

The best practice in educational construction work recognizes the importance of a swift and dependable interior telephone system.

Leading architects engaged in planning new school and college buildings consider Inter-Phones an essential part of the design and equipment. School boards very definitely appreciate the importance of this telephone system that knits all the individuals of the teaching staff together—without, at the same time, requiring the services of an operator.

CRADLE HAND SET

Coupled with their extreme simplicity — the user merely pushes a button to make the desired connection—Graybar Inter-Phones are reliable in the extreme. Associated with them is over a half century of experience in the supplying of telephones and telephone equipment. In addition to this, the longest record of service in the field of sound transmission, are the high precision standards to which Graybar Inter-Phones are built and tested.

ITS RECORD

The most conclusive proof of the high quality of Graybar Inter-Phones is their performance in actual service. Inter-Phones have been installed in all kinds of schools and colleges from coast to coast, rendering in every case satisfactory service.

WALL TYPE

Inter-Phones are made in various styles to meet a wide variety of requirements. On this page are shown two such styles.

One is the wall type; the other is the cradle hand set type.

The selection of the proper type of Inter-Phone is considerably simplified by the large amount of information and experience records available. Graybar Inter-Phone specialists will be glad to place this material at the disposal of architects and school boards.

LIGHTING

That which in commmercial fields is largely a financial consideration becomes sometimes in educational work, a matter of serious importance bearing on the physical and mental progress of many individuals.

THE LINCREST

Proper lighting, in schools, is a great factor in conserving the eyesight of youth and in accelerating the rate of progress of the student.

Approached from that angle, Graybar's complete line of scientifically designed lighting units assumes considerable significance.

Foremost among these is the Graybar Shelcrest. Here is a distinct advance in lighting fixture practice. To begin with, its stem is entirely of Bakelite, which, aside from the practical consideration of extreme ease of cleaning, gives the entire unit that conspicuous warmth, richness and trimness of finish characteristic of this material. The stem comes in sections, permitting ease and flexibility of installation. The globe is held by a patented safety device.

Another popular Graybar lighting unit is the Lincrest. This fixture, also a safety type, combines simple beauty of design, correct electrical and illumination characteristics and highest grade of material and workmanship.

Among other types of Graybar lighting units are the Stancrest (which varies from the Lincrest chiefly in that the globe is held by set screws) and the Faircrest (an even more economical unit, typical in every way of Graybar quality).

All these units are available with the famous "99" or "66" glass, or with special glass to suit individual requirements.

THE SHELCREST

MANY SUCCESSFUL INSTALLATIONS

Among the many successful installations of Graybar lighting units are the following:

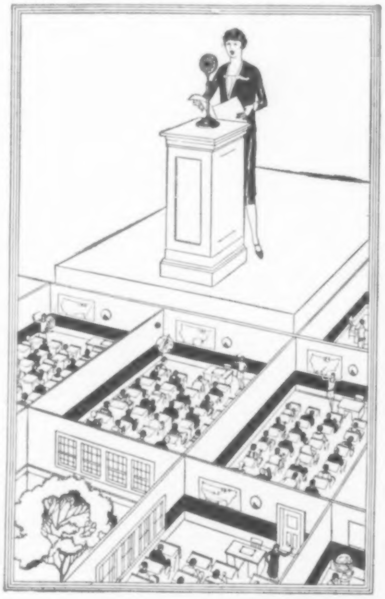
Kansas City School	Kansas City, Mo.
Frazier School	Atlanta, Ga.
William Ruffner School	Norfolk, Va.
Eau Claire High School	Eau Claire, Wis.
City Schools	Gary, Ind.
Belmont School	Dayton, Ohio
Park City School	Knoxville, Tenn.
Garfield High School	Johnstown, Pa.
Marquette University	Milwaukee, Wis.
University of Wisconsin	Madison, Wis.
Virginia Polytechnic Institute	Blacksburg, Va.
Asheville City Schools	Asheville, N. C.
Syracuse University	Syracuse, N. Y.
Tulane University	New Orleans, La.
Public Schools	Buffalo, N. Y.
Spokane Public Schools	Spokane, Wash.
Marietta High School	Newark, N. J.
New Central High School	Johnstown, Pa.
Foch School	Detroit, Mich.
North Carolina State College	Raleigh, N. C.
Ohio State University	Columbus, Ohio
Massachusetts Tech.	Cambridge, Mass.
Colorado Agricultural College	Fort Collins, Colo.
University of Minnesota	Minneapolis, Minn.
University of Illinois	Champaign, Ill.
Rosary College	River Forest, Ill.
Purdue University	Lafayette, Ind.
College of the Pacific	Stockton, Calif.
Hazleton High School	Hazleton, Pa.
Piedmont Junior High School	Charlotte, N. C.
Villa Juliene High School	Dayton, Ohio
Butler High School	Springfield, Ohio
Grovefoot School	Columbus, Ohio

PUBLIC ADDRESS SYSTEMS

A new and striking development in educational equipment has come to the fore in recent years.

It is the Western Electric Public Address System; and its installation permits the distribution of speech and music to any or all parts of the school building at once. Its most conspicuous applications are as follows:

1. Transmitting fire drill instructions. (In actual emergency value alone, a sufficient justification for the system.)
2. Conveying the principal's morning address to all rooms at once.
3. Transmitting music from the auditorium or from the music teacher's station to any desired rooms.
4. Transmitting gym instructor's commands to all rooms.
5. Conveying a visitor's, or a special instructor's, speech to all parts of the building.
6. Receiving and transmitting educational radio programs (such as the Damrosch Concerts) to all rooms.
7. Amplifying speaker's voice in auditorium; particularly important for children's weak voices.



A GRAPHIC INTERPRETATION OF THE MANNER IN WHICH THE PUBLIC ADDRESS SYSTEM UNITES A SCHOOL AS IF ALL CLASSROOMS WERE ONE

In short, the system brings the largest school together as if all classrooms were one. Many other uses along these lines will suggest themselves. The foregoing by no means attempts to cover the entire range of usefulness of the Public Address System.

THE TEST OF ACTUAL PRACTICE

So fundamental is the Public Address System that its use has already become quite widespread. One school after another has installed it, with a resultant increase in interest in the work on the part of both teachers and students.

A QUALITY PRODUCT

The Western Electric Public Address System is essentially a quality product. It is made by the makers of the nation's telephones—the greatest, and the oldest organization of sound transmission equipment experts with an experience that dates back to 1869.

The distributors of Western Electric products, Graybar Electric, offer to school executives and architects the benefit of experience accumulated through contact with a wide variety of school, public building, hotel, hospital and other installations.

AMONG THE MANY SCHOOL INSTALLATIONS ARE

San Jose High School, San Jose, Cal.
Monroe High School, Rochester, N. Y.
Drexel Institute, Philadelphia, Pa.
University of Idaho, Moscow, Idaho
Tuskogee Normal Institute, Birmingham, Ala.
Western Reserve University, Cleveland, Ohio
Fullerton High School, Los Angeles, Cal.
South Orange and Maplewood High School, N. J.
Little Rock High School, Little Rock, Ark.
St. John's College—School of Law, Brooklyn, N. Y.
Ohio State University, Columbus, Ohio
New Jersey State College for Women, New Brunswick, N. J.
Webster Junior High School, Oklahoma City, Okla.
University of Washington, Seattle, Wash.
University of Utah, Salt Lake City, Utah
Kruttschnitt School, New Orleans, La.
LaSalle School, New Orleans, La.
Washington High School, Milwaukee, Wis.
Hollywood High School, Los Angeles, Cal.

C. S. HAMMOND & COMPANY, INC.

Map Engravers, Printers and Publishers since 1900

NEW YORK BROOKLYN BOSTON

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60-62 FRANKLIN AVE., BROOKLYN

THE NEW WORLD LOOSE LEAF ATLAS

The world is ever moving, changing, progressing. Each passing month leaves its mark upon the map. New cities are born; new counties are created; even new nations sometimes spring into existence. Railroads extend their lines; new water routes are opened; new lands are discovered, and every change makes the old-fashioned, permanently bound atlases more and more out of date, less and less accurate and dependable.

The New World Loose Leaf Atlas is not bound in the old-fashioned way. It is in reality a collection of maps held firmly together by a loose leaf binder from which individual maps, when they become obsolete, may be removed and replaced by new ones.

It is generally recognized that maps have become indispensable in business, in school, and in the home. They are essential to complete understanding of the newspaper dispatches we read each day and of the great international questions which are constantly arising. The maps, however, must be down to date and complete, otherwise the false impressions will result in worse confusion than if no maps at all were consulted. Since bound atlases become old within a few months after their purchase, the New World Loose Leaf Atlas alone provides a satisfactory, convenient and economical solution.

Each owner of the Atlas receives twice a year sets of Correction Maps to be inserted in his Atlas in place of the old ones which have become obsolete through recent changes. These maps are printed on single pages, uniform in size with those in the Atlas, so that when they are inserted, the book is as complete and down to date as on the day of purchase.

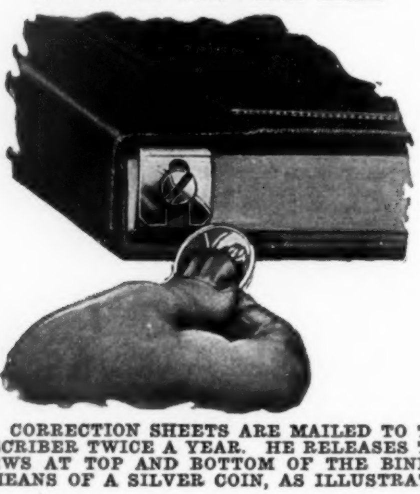
Not only is the New World Loose Leaf Atlas under constant revision and improvement but it is TO-DAY

THE BEST AND LARGEST COLLECTION OF MAPS MADE IN AMERICA.

The superb examples of cartography embrace the whole world, correctly and exhaustively. Briefly, the collection may be itemized as follows:

58 Physical and Economic Maps
184 Political Maps of Foreign Countries
78 Historical Maps
70 Detailed Maps of the United States

THESE ILLUSTRATIONS SHOW HOW VERY EASY IT IS TO REVISE THE NEW WORLD LOOSE LEAF ATLAS



1ST. CORRECTION SHEETS ARE MAILED TO THE SUBSCRIBER TWICE A YEAR. HE RELEASES THE SCREWS AT TOP AND BOTTOM OF THE BINDER BY MEANS OF A SILVER COIN, AS ILLUSTRATED

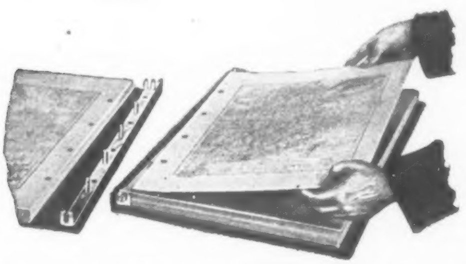
2ND. AS SHOWN ABOVE, THE FRONT COVER MAY THEN BE EASILY REMOVED AS WELL AS THE MAPS WHICH ARE TO BE REPLACED WITH NEW ONES

GRAPHIC PICTURES OF ACTUAL CONDITIONS

The Physical and Economic maps are full of vital information, enabling one to visualize existing conditions in all parts of the globe. The maps show relief, climate, temperature, vegetation, population, mining and agricultural products, and many other phenomena.

THE WORLD IN MAPS

The maps of Foreign Countries show the world as it is today. Every country is shown on large scale and in great detail. For instance, five pages of maps are devoted to France, three to China, seven to South America, nine to Canada, etc. These maps show the mountains and hills in gray, water areas in blue, railroad routes in carmine, the political boundaries in tint, and the names of political subdivisions, places and topographic features in black.



3RD. THE CORRECTION SHEETS MAY THEN BE INSERTED IN THEIR PROPER PLACES AS SHOWN ABOVE. THE COVER IS REPLACED, THE TWO SCREWS TIGHTENED AND—

HISTORY IS GRAPHICALLY TOLD

on the 78 Historical Maps in the New World Loose Leaf Atlas. This series of maps will enable you to trace the whole course of events from ancient times to the present day.

THE MAPS OF THE UNITED STATES

are exceptionally fine ones, being engraved on large scales with a vast amount of detail. Many of the states are shown on double page plates. With very few exceptions, these maps show every post-office and railroad station in the country, as well as all countries, rivers, reservoirs, parks, etc. Every mile of railroad, both steam and electric, is shown.

COMPLETE AND USABLE INDEXES

The index of each map appears on the pages immediately preceding and following the map, so that a place may be located quickly by means of the index references. The indexes include every county, or other minor sub-division, city, town, village, and hamlet with latest population figures.

THE 390 MAPS IN THE ATLAS

vary in size but most of them measure 11 x 18 inches. The pages are uniformly 13½ x 19½ inches and have four holes punched along the inner edge, to fit over the posts of the binder.

4TH. THE ATLAS, REVISED TO DATE, APPEARS AS SHOWN ABOVE, THE WHOLE PROCESS OF REVISION TAKING LESS THAN TEN MINUTES, SEMI-ANNUALLY

The removable front cover holds the sheets firmly in place and is itself fastened to the back cover by screws at top and bottom. When new sheets are to be inserted, these screws are easily loosened by twisting them with a silver coin.

SOME OF THE COLLEGE LIBRARIES USING THE ATLAS

Universities of Arizona, Arkansas, California, Delaware, Georgia, Hawaii, Illinois, Kansas, Maryland, Minnesota, Missouri, Nebraska, New Hampshire, North Carolina, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Washington, Wyoming, Yale, New York, Columbia, Harvard, Northwestern, Cornell, Ohio State University, Bowdoin College, Massachusetts Industrial College, University of Chicago, Williams, Vassar, U. S. Naval Academy, Oberlin College.

SCHOOLS AND ACADEMIES

High Schools in Hollywood, Cal., Stockton, Cal., South Bend, Ind., Kansas City, Mo., St. Louis, Mo., Newark, N. J., Orange, N. J., Albuquerque, N. M., Auburn, N. Y., Philadelphia, Pa., Logan, Utah, Page Military Academy, Los Angeles, Cal. Miss Porter's School, Farmington, Conn., Beverly Farm School, Godfrey, Ill., Northfield Seminary, East Northfield, Mass., Lowell Textile School, Lowell, Mass., Knox School, Cooperstown, N. Y., Dan Beard's Outdoor School, Flushing, N. Y., Franklin and Marshall Academy, Lancaster, Pa., Staunton Military Academy, Staunton, Va.

BINDING AND PRICE

The loose leaf binder is covered with handsome, red crash and stamped in gold and blue. It measures 14 x 20 inches. The price, including two installments of correction sheets, is $50.00.

LIBRARY BUREAU EQUIPMENT FOR TEACHING FILING

THE ECONOMY OF SPEED

The Kardex record is a speed record. For Kardex is visible record keeping. The filing title of every card is exposed in the Kardex cabinet. Your eye spots the one you want instantly—without a sign of fumble. Your school administrative records will be maintained more speedily and more accurately if kept in Kardex.

For the essential facts recorded on Kardex cards are also visible. Detailed reference to the body of the form is rarely necessary. Brightly colored signals, on the indexing margins of the cards, put you in command of the facts immediately. And you act intelligently because you act ontime.

THE SAFE-CABINET

LEARNING BY DOING

The graduate in office practice is immediately at home in an office if she knows how to file. Instruction in filing is necessarily instruction in the methods of business routine. The Library Bureau filing course ought to form a part of every school's commercial curriculum.

Students of this course learn by doing. Each uses a miniature filing system of his own. Each does the work a filing clerk would do. Each gains theory from the text and applies it by actual practice with a miniature file.

THE KARDEX CABINET

SAFETY FOR RECORDS

A record worth keeping is worth safekeeping. Its value may be greatly enhanced after the visit of a destructive fire. Untold difficulties and loss often result from the burning of the records that schools maintain.

The Safe-Cabinet is the world's safest safe. Its ability to protect its contents against fire has been tested by fire. The results of these tests are embodied in specifications for heat resistance which may be matched against the degree of exposure to loss by fire.

YAWMAN AND ERBE MFG. COMPANY

MAIN FACTORIES AND EXECUTIVE OFFICES

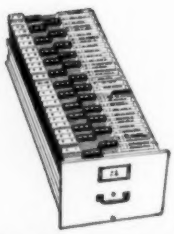
17 Jay Street, ROCHESTER, N. Y.

Steel-and-Wood Files, Steel Shelving, Desks, Safes, Office Systems and Supplies

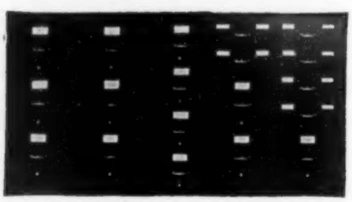
"Y and E"

Bank and Library Equipment, School Administration Equipment

"Y AND E" MAKES EVERYTHING FOR YOUR OFFICE



The "Y and E" Direct Name System is a fast, accurate and simple method of filing now in use in thousands of offices throughout the country



"Y and E" Filing Cabinets in wood and steel cover every possible requirement of an office. Ask to see the "Y and E" Fire-Wall Steel File

"Y and E" Steel Shelving comes in a variety of widths, heights and depths to meet every shelving need. Good looking, easy to install, easy to move

Possibly you have been thinking about some new office equipment. It may be a single item such as a desk, filing cabinet or chair, or you may be considering complete equipment for one office or an entire building.

Investigate. Get equipment that is built for your particular needs; get equipment that is modern in the work that it accomplishes as well as the appearance it presents; get equipment that will pay you the biggest dividends in saving of time and labor—and in speeding your office work.

Take a steel filing cabinet for instance. Any steel file will contain your records. But it is possible for you to get a cabinet that will not only contain your records but protect them from fire as well. So when buying steel files why not get files that have this extra advantage? "Y and E" Fire-Wall steel files have double steel walls insulated with asbestos. The drawers operate on ball-bearing slides and each drawer is

equipped with an automatic safety latch that keeps the drawer shut regardless of the position of the cabinet.

The protection of vital irreplacable records is a personal responsibility of each individual business. Such records cannot be covered by insurance against loss or destruction, nor can their safe-keeping be delegated for outsiders. "Y and E" Underwriters' "A" and "B" Label Safes were designed and built to answer the demand for certified protection that is permanent.

And in a "Y and E" efficiency desk drawers operate on roller-bearing slides. All often-referred-to records right at your finger tips.

Then, too, there are the "Y and E" courses, text books and practice equipment for teaching indexing and filing. No secretarial or business course is complete that has not thoroughly covered this important subject.

Briefly we mention just a few of the items manufactured by "Y and E" and the illustrations on these pages are only suggestive of the complete lines of "Y and E" office equipment. Descriptive literature and detailed information covering any of the various items or groups will gladly be sent you on request.

ACME DIVISION

INTERNATIONAL PROJECTOR CORPORATION

90 Gold Street, NEW YORK CITY

USE OF MOTION PICTURES IN THE SCHOOL

Through their educational power, motion pictures have become popular in modern schools. Students learn more, retain more and remember more, when lessons are shown to them in motion pictures. In geography, history, economics, chemistry and physics, motion pictures are invaluable for they present the subject in a way which commands and stimulates attention.

In addition to their educational features, motion pictures are valuable as a money-raising source for extra curriculum activities.

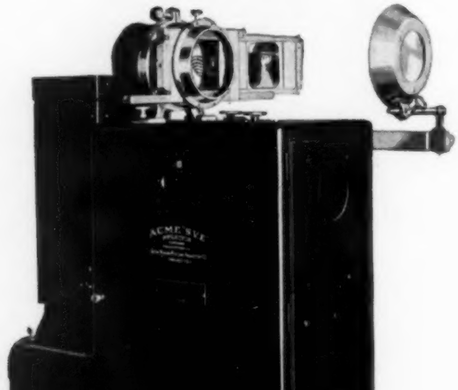
ACME PROJECTORS

Acme Projectors, though professional in construction, are made especially for non-professional use. They are safe and easy to operate. Through a patented process, the film can be stopped at any point for as long as desired. The Acme S. V. E. is equipped with a stereopticon attachment. This machine shows motion pictures, stereopticon slides and still pictures from motion picture film. All Acme Projectors use standard size films. Delivered complete and ready for operation. Just plug in and it is ready for use.

CATALOG AND INFORMATION

Detailed information concerning not only Acme Projectors but also containing complete date on the use of motion pictures in the school will be mailed free of charge or obligation. If you wish we will arrange a free demonstration in your own school.

In requesting information, ask for Booklet 2N.



THE ACME S. V. E. SEMI-PORTABLE

Motor driven on ordinary 110 volt, alternating or direct current. 1000-watt lamp. Brilliant pictures guaranteed at any distance up to 100 feet from the screen.

THE ACME PORTABLE

Carries like a suitcase. Operates on current from any light socket. Brilliant pictures at any distance up to 65 feet from screen. Built for those who want a portable projector that gives professional results.

THE BROOKS COMPANY

1241 Superior Avenue, CLEVELAND, OHIO

OFFICES IN 83 PRINCIPAL CITIES

BROOKS VISUALIZERS

THE ONLY VISIBLE RECORD EQUIPMENT WITH THE "MILITARY SHIFT"

The most important factor in record-keeping is the equipment. Quickly prove this by reviewing the manner in which your own educational records are kept. Don't you find some whose efficiency and usefulness would be increased through application of better suited equipment? Wouldn't it mean considerable to be able to keep one or more of these records in about one-half the time now required? Wouldn't easier operation, greater accuracy and less clerical expense in keeping such records be well worth considering?

The Military Shift found only in Brooks Visualizers is the greatest time-saving device of visible record equipment. With it you can instantly create a space for a new sheet at any point in a record and in a reverse manner close a space when a sheet is removed—all without removing any other sheets. See the shift—operate it and you'll instantly realize its value to record-keeping.

Public and private schools, Boards of Education, colleges and universities in various parts of the country use Brooks Visualizers for such records as:

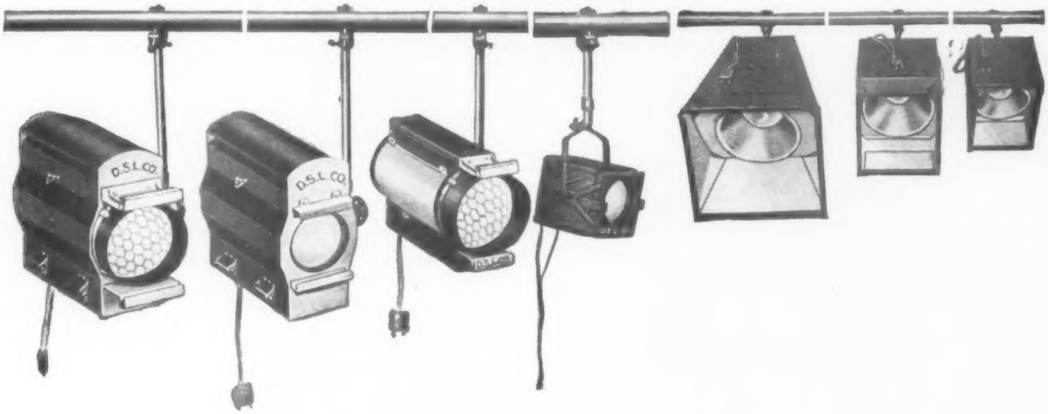
- Registration
- Scholastic
- Attendance
- Health
- Athletics
- Activities
- Personnel
- Teacher's Salary and Permanent Record
- Ledger
- Financial
- Subscription
- Student's Loan
- Stock and Supplies
- Equipment
- Maintenance

Brooks Visualizers can do these things for you and 100% visible indexing of records in compact, portable units is only part of the story.

Write for interesting booklet "Keeping Track of John Brown, Student"

DISPLAY STAGE LIGHTING COMPANY, INC.

410 WEST 47TH STREET, NEW YORK CITY



LIGHTING THE SCHOOL STAGE

School builders of today recognize the importance of including in their school plan an adequate, attractive auditorium with a good, well-lighted stage on which all kinds of school activities from dramatics to acrobatics can be presented.

Stage lighting is today accepted as a vital factor in the success of every evening exhibit, entertainment or celebration held in the school auditorium.

The Display Stage Lighting Company, pioneers in the art of stage lighting, have played an important part in its development. World-wide recognition of the merits of our stage lights has enabled us to grow constantly and rapidly, until today we can meet every demand in stage lighting satisfactorily and promptly.

"A Light for Every Purpose" . . . No order too large . . . no order too small . . . all will meet with our prompt and careful attention.

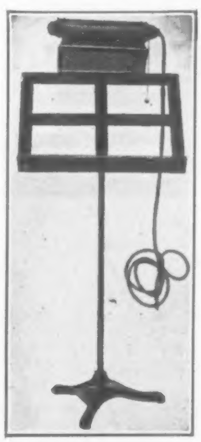
SPECIAL FREE SERVICE

We shall be glad to advise you regarding any special problem of lighting that may come up in the planning of your new school auditorium and stage.

CATALOG

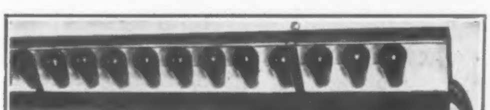
For the use of heads of departments and their classes we will send our complete illustrated catalog of "Theatrical Lighting and Effects," describing:

Complete electric lighting equipment for theatrical productions, pageants, expositions; architectural and show window lighting; standard units or specially designed apparatus for individual problems; theatrical lighting effects, apparatus and supplies; and spectacular and electro-mechanical effects.



MUSICIAN'S STAND

ENTRANCE STRIP



BORDER LIGHTS

PROSCENIUM STRIP

THOMAS A. EDISON, INC.

Laboratory and General Office: ORANGE, N. J.

London Office: Vernon Place, Southampton Row

WORLD-WIDE SERVICE IN ALL PRINCIPAL CITIES

Ediphone

Thos. A. Edison's New Dictating Machine

The use of the new Ediphone in business offices everywhere is evidence of its popularity. Executives and secretaries alike find that the Ediphone makes the business day easier and more productive. During office hours or after, the Ediphone is always instantly available. The executive, talking naturally without waiting, gains an entirely new freedom for action. The secretary, typing in comfort without interruption, is relieved from time-consuming dictation routine for her more important duties.

Progressive business schools now include Ediphone instruction as a necessary part of their secretarial courses.

The Executive Ediphone combines all the essentials of dictation convenience and facility. Executives gain time and are freed from laborious longhand notes, memoranda, etc., and from tiresome shorthand dictation periods. Always at the desk with its automatic operation it makes of dictation an incident like telephoning.

The Secretarial Ediphone enables Secretaries to organize their work, to give more thought and care to each duty and to perform many duties always wanted but impossible for lack of time.

The new Ediphones are distinguished by electric control, succeeding slower mechanical devices.

The dictator enjoys speaking conversationally and comfortably to a large mouthpiece which clearly records the voice.

Stenographers have the voice at the finger tips with Typease, attached to any typewriter. A light tap by the thumb, like operating the space-bar, causes the voice to speak or repeat. This is ideal for the touch typist, adding speed and reducing fatigue to a minimum.

Edison's New Secretarial Ediphone

WORLD-WIDE SERVICE

Ediphone Sales and Service stations in all principal cities study correspondence problems and advise with executives without charge.

Telephone the Ediphone, your city, for particulars or ask us for the booklet "Getting Action." It's free.

EASTMAN TEACHING FILMS, INCORPORATED

SUBSIDIARY OF EASTMAN KODAK COMPANY

Producers of Eastman Classroom Films

ROCHESTER, NEW YORK

FILMS NOW READY

GEOGRAPHY

New England Fisheries Part I—Cod
New England Fisheries Part II—Mackerel
Wisconsin Dairies
Wheat
From Wheat to Bread
Cattle
Corn
Cotton Growing
Irrigation
Anthracite Coal
Electric Power in the Southern Appalachians
Furniture Making
Bituminous Coal
Iron Ore to Pig Iron
Pig Iron to Steel
The Panama Canal
The Philippine Islands
Hawaiian Islands
The Mohawk Valley
Peanuts
From Tree to Newspaper
The Golden Gate
The Automobile
The Arid Southwest
Tableware
Market Gardening
Meat Packing

GENERAL SCIENCE

Hot Air Heating
Atmospheric Pressure
Compressed Air
The Water Cycle
New York Water Supply
Purifying Water
Limestone and Marble
Sand and Clay
Reforestation of Waste Lands
Planting and Care of Trees
Water Power
Simple Machines

CHEMISTRY

Glass Blowing—Part I
Glass Blowing—Part II
(For advanced high school or college. In separate reels or combined in one reel.)

BIOLOGY

Life History of a Yellow Fever Mosquito

MANUAL TRAINING

Making a Taboret

CIVICS

Safety at Sea

A program adequate to the needs of the schools is being planned, and additional films are being produced from month to month.

Inquiries in relation to these films will be given prompt attention.

FACILITIES

Eastman Teaching Films, Incorporated, has at its command all the resources of the Eastman Kodak Company with its long photographic experience and its unsurpassed facilities for research. The personnel includes practical educators, editorial writers and photographic technicians.

This fortunate combination makes it possible for Eastman Teaching Films, Incorporated, to offer to schools, carefully planned classroom films and projection equipment, at a moderate price.

NATURE AND USE OF THE FILMS

Eastman Classroom Films are distinguished by the care shown in their planning and production. Every effort is made to secure accurate information on each topic, and to present it in a teachable film adjusted to pupil needs and curricula requirements. It is the purpose of the films to SUPPLEMENT rather than supplant other teaching devices.

The films are made only on 16 millimeter "safety" stock, low in cost, free from fire risk, and requiring no booth or licensed operator. By means of reliable Eastman projectors they are thrown on a screen IN THE CLASSROOM. Without a break in the lesson, the point under discussion is illustrated, amplified and driven home with a clearness and forcefulness attainable by no other means.

WHAT THESE FILMS ACCOMPLISH

Teachers using Eastman Classroom Films report that pupils show:

1. An increased interest in school work.
2. More originality.
3. An ability to concentrate, to think more accurately, and to reason more soundly.
4. An increase in the **quantity**, and an improvement in the **quality** of their reading.
5. A marked improvement in the range and accuracy of their vocabulary.
6. An opening of the eyes to the meanings of things seen about them.
7. An extension of experiences beyond their immediate environment.

Booklets entitled "The Story of Eastman Classroom Films" and "Projectors and Screens for Eastman Classroom Films" will be mailed on request.

ELECTRO-ACOUSTIC PRODUCTS COMPANY

55 East Wacker Drive, CHICAGO

Electro-Acoustical Equipment and Engineering

AMPLIFIERS

Complete Public Address and Radio Distribution Systems

MICROPHONES

For Schools, Colleges, Churches, Auditoriums, Stadiums

Photograph of the Amplifier installed in the New Chicago Stadium.

This apparatus is a part of the ELECTRO-ACOUSTIC PRODUCTS CO.'S public address system.

PUBLIC ADDRESS AND RADIO DISTRIBUTION SYSTEMS

The Electro-Acoustic Products Company amplifiers represent the latest developments in the field of sound amplification and reproduction. Incorporated in them are the most recent improvements of the radio receiver and transmitter and alternating current power supply.

Electro-Acoustic amplification is rapidly becoming an essential part of the modern school plan. Such a system is not only a remarkable convenience, but also a great time saver. It affords extended educational programs and includes many entertainment features. It is indispensable in the stadium and auditorium.

Our systems have been preferred by the leading institutions in the country because of their extreme efficiency. Simplicity in operation and freedom from maintenance of equipment are some of the outstanding features. Voice and music are reproduced with precise naturalness.

Write us for detailed information on our complete line.

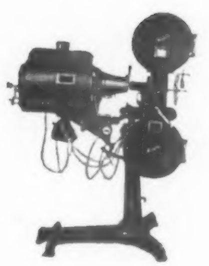
INTERNATIONAL PROJECTOR CORPORATION

90 Gold Street NEW YORK, N. Y.

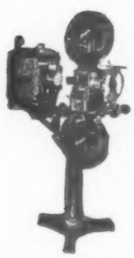
SIMPLEX AND POWER'S

PROFESSIONAL PROJECTORS FOR SCHOOLS AND COLLEGES

POWER'S PROJECTOR WITH INCANDESCENT EQUIPMENT



SIMPLEX PROJECTOR WITH REFLECTOR ARC EQUIPMENT



SIMPLEX PROJECTOR WITH INCANDESCENT EQUIPMENT

For nearly a quarter of a century, a period covering the entire commercial history of the motion picture industry, the products of the International Projector Corporation have played a conspicuous part in the development of this field. In our shops were originated and developed the safety devices, ease of operation and light sources of motion picture projectors which permit them to be used with eminently satisfactory results in the motion picture palaces of the world's greatest cities and with dependability in the remote and isolated parts of the globe.

There has been a marked extension of the use of motion picture films in schools during the last few years, school auditoriums and in classrooms. It is hardly possible to emphasize too strongly the importance of good projection, which will to a large extent depend upon the use of the best possible equipment.

PENN ART CRAYON COMPANY

385 William St., EASTON, PENNA.

CALX SCRATCHLESS CRAYONS

Probably everyone who has ever been in a schoolroom has had his nerves rasped by the grating and squeaking of a piece of crayon against a blackboard, and has seen the scratch left on the blackboard as a result. No doubt he has also seen much gray, indistinct writing on blackboards, which has meant serious eyestrain for some of the children and has probably been the cause of considerable inattention on the part of many of the others!

Grittiness and grayness in blackboard writing can be eliminated by proper care in manufacture of crayons and the use of proper materials. A very high percentage of chalk must be used, and all grit and other foreign matter and impurities removed by the washing and precipitating process.

Also, the binding ingredient must be greaseless. Greasy materials used as a binder in most brands of crayon adhere to the blackboard, coating it with a gray film which destroys its usefulness. CALX Crayons are as nearly greaseless as it is possible to make them.

Not only are CALX Scratchless Crayons gritless and scratchless and greaseless, making a clear, broad, white mark for all to see, but they have the added advantage of being as nearly dustless as is possible. The dust, instead of filling the air and causing coughing and unpleasantness, simply drops.

A "CHALK TALK"

This "Chalk Talk" merely consists of a few **"Don't's."**

Don't increase the nervous tension in your schoolrooms by allowing the use of gritty, squeaky crayons.

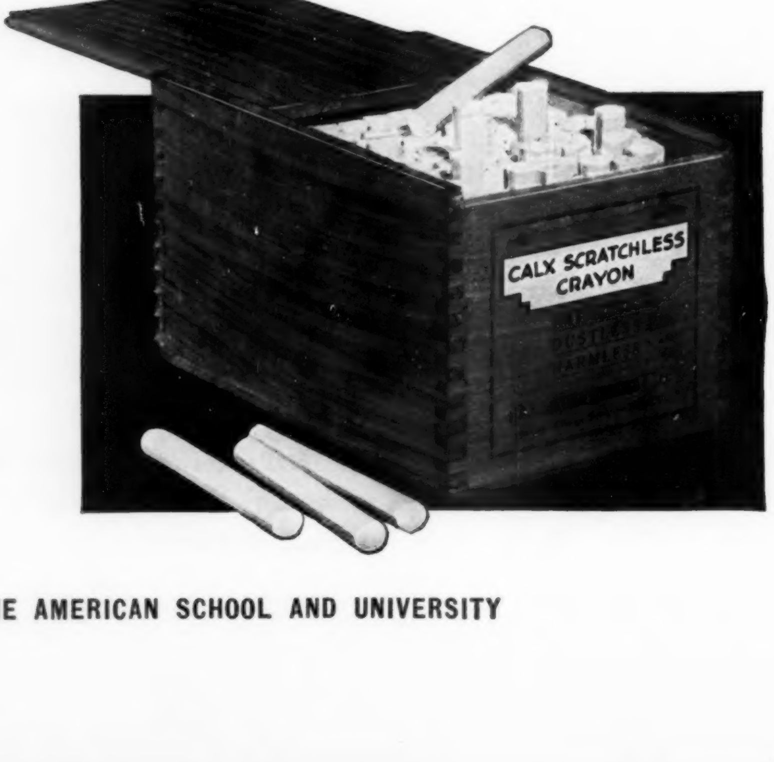
Don't run any risk of impairing the eyesight of the pupils by using inferior crayon which writes indistinctly.

Don't ruin your blackboards by using cheap, gritty crayons. Blackboards are expensive, and even the best crayons are inexpensive.

Don't forget to specify CALX Scratchless Crayons.

CRAYON SPECIALISTS

We are manufacturers of crayons exclusively. Whether you wish our CALX grade which is the best obtainable or desire a medium or inexpensive grade of crayon we can supply your needs economically. Write us for quotations.



CALX
SCRATCHLESS
GREASELESS
DUSTLESS
CRAYONS

RADIO-VICTOR CORPORATION OF AMERICA

ENGINEERING PRODUCTS DIVISION

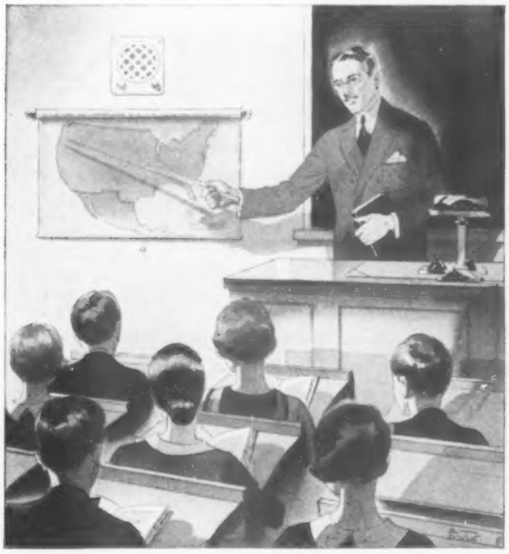
261 Fifth Avenue, NEW YORK CITY

CHICAGO, ILL.	ATLANTA, GA.	DALLAS, TEX.	SAN FRANCISCO, CALIF.
100 West Monroe St.	101 Marietta St.	Santa Fe Bldg.	235 Montgomery St.

R C A
CENTRALIZED RADIO
is ideal for school use

Radio has become of such importance as an educational help that the Radio-Victor Corporation of America has devised a special system of simplified radio reception for educational institutions.

R C A Centralized Radio equipment consists of a central receiving apparatus and control board which receives selected radio programs and distributes them throughout the building, to be reproduced by loudspeakers set in the walls of rooms.



Loudspeakers for R C A Centralized Radio installations are set in the wall. They are provided with station switch (for one to four stations) and volume control

Each loudspeaker is independently operated when the reception of programs in individual rooms is desired. Equipment can be installed to transmit a single program, or to make available the choice of programs from two, three or four broadcasting

Central control board for R C A Centralized Radio

stations. As many as 3000 rooms can be connected to the central apparatus.

For further information regarding the use of R C A Centralized Radio in educational work, write to the Engineering Products Division, Radio-Victor Corporation of America, in any of the cities named above.

L C SMITH & CORONA TYPEWRITERS INC

51 Madison Avenue, New York, N. Y.

Completeness and durability are probably the two most important factors to be considered in selecting a typewriter for use in schools and colleges.

The L C Smith typewriter is outstanding in both of these respects.

COMPLETENESS

The L C Smith machine has many features in common with other standard typewriters, but it has also several important ones not found in other writing machines. Owing to the variety of work that can be done on the same L C Smith, the owner is saved from buying additional machines or attachments.

DURABILITY

The remarkable durability of the L C Smith is recognized wherever this machine is used.

A few other advantages of the L C Smith are—Ball-bearing construction, light touch, easy action, speed and quietness.

SEND FOR THE FACTS

Write for literature enumerating the many points of superiority that make the L C Smith the ideal typewriter for use in schools and colleges.

We shall also be glad to send you special literature telling about the L C Smith and Corona school service and how this service is designed to aid schools and colleges throughout the country in their efforts to raise the standard of typewriting.

THE STANDARD ELECTRIC TIME COMPANY

SPRINGFIELD, MASS.

The Standard Electric Time Co. of Canada, Ltd., 726 St. Felix St., Montreal, P. Q.

ATLANTA, 204 Glenn Bldg.
BALTIMORE, 2 E. Redwood St.
BIRMINGHAM, 625 S. 18th St.
BOSTON, 10 High St.
BUFFALO, 901 Mutual Life Bldg.
CHARLOTTE, N. C., 217 Latta Arcade
CHICAGO, 1510 Monadnock Bldg.
CLEVELAND, 1333 Union Trust Bldg.
COLUMBUS, O., 83 South High St.
DALLAS, 716 Mercantile Bank Bldg.
DENVER, 562 Penn St.
DETROIT, 806 Donovan Bldg.
KANSAS CITY, MO., Mutual Bldg.
LOS ANGELES, Room 670, 124 W. 4th St.
MINNEAPOLIS, 745 McKnight Bldg.
NEW YORK CITY, 50 Church St.
PHILADELPHIA, 1612 Market St.
PITTSBURGH, Bessemer Bldg.
PORTLAND, ORE., 65 First St.
SAN FRANCISCO, 1 Drumm St.
SCRANTON, 148 Adams Ave.
SEATTLE, 918 Western Ave.
SPOKANE, 110 S. Cedar St.

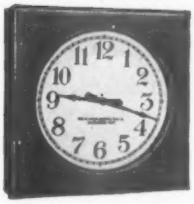


FIG. 116
SQUARE WOOD CASE SECONDARY CLOCK

ELECTRIC TIME EQUIPMENT

Standard Electric Time products are the result of nearly half a century's experience in the manufacture and installation of school equipment. They are manufactured of the best materials obtainable, by skilled labor, under expert supervision, and are engineered and installed under a system which insures absolute satisfaction to the owner.

The "Standard" line of electric time equipment now comprises two distinct systems both of the minute impulse type—one designed for operation usually from storage or primary battery without automatic resetting—the other operating from 110 volt A.C. current or battery with automatic resetting control.

While System No. 1 of the non-resetting type can be operated from 110 volt A.C. current supply, it is more satisfactory to use an automatically charged storage battery for the source of current, thus avoiding interruption of the service.

System No. 2 of the automatic resetting type operates on a two-wire circuit—hence any present "Standard" system can be rearranged as an automatically reset battery-less system, if desired. (This system can be more readily effected on multiple than on series systems.)

FIG. 803
PROGRAM BELL

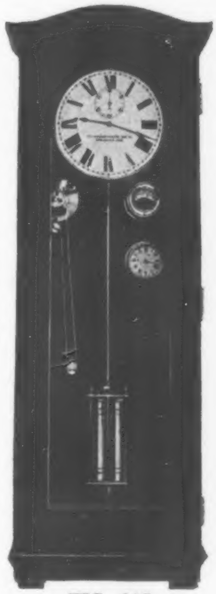


FIG. 105
MASTER CLOCK
60-BEAT MERCURIAL PENDULUM

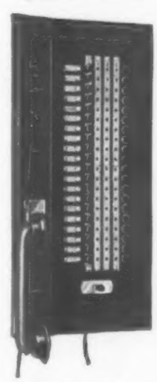


FIG. 818
COMBINATION BELL CONTROL BOARD AND CENTRAL TELEPHONE STATION

FIG. 118
ROUND METAL CASE SECONDARY CLOCK

Standard Electric Time Equipment has been the predominant choice of school boards and architects for many years, owing to its superior excellence and unquestioned reliability. "Standard" manufactures and furnishes all types of program bells.

SCHOOL TELEPHONE SYSTEM

The "Standard" School Telephone system is combined with the bell control board and furnishes a selective ringing, common talking system of the utmost simplicity and reliability operating from the same current supply.

See pages 127 and 382 for description of "Standard" fire alarm equipment and "Standard" laboratory systems.

Complete specifications, estimates and other data will be gladly furnished architects or other school officials upon request. Write Home Office or nearest branch.

FIG. 819
WALL TELEPHONE WITH WATCH-CASE RECEIVER

WITTLIFF FURNITURE BRACE COMPANY

2810 Superior Avenue, CLEVELAND, OHIO

WITTLIFF BRACES MAKE OLD CHAIRS STRONG

They eliminate breakage and necessity of regluing, thereby saving time, labor and repair expense.

KEEP NEW ONES STRONG

New chairs are permanently new when equipped with Wittliff Braces. They are simple and easy to attach.

Braced from the outside—a patented feature guaranteeing permanent stability for all types of chairs.

BRACED FROM THE OUTSIDE—A PATENTED FEATURE GUARANTEEING PERMANENT STABILITY FOR ALL TYPES OF CHAIRS

A FEW PROMINENT USERS

Milwaukee Board of Education, Milwaukee, Wis.
Princeton Board of Education, Princeton, N. J.
Trenton Board of Education, Trenton, N. J.
Columbia University, New York City
College of New York, New York City
Massachusetts Institute of Technology
Oberlin College, Oberlin, Ohio
Roosevelt School, Clinton, Iowa
North Central College, Naperville, Ill.
Monmouth College, Monmouth, Ill.
Lambord College, Galesburg, Ill.
Freeport Board of Education, Freeport, Ill.
Coe College, Cedar Rapids, Iowa
Chicago Board of Education
Princeton University
Hotel Pennsylvania, New York City
Hotel Astor, New York City
Hotel Breakers, Atlantic City
Great Northern R.R.
Chicago Board of Trade, Chicago, Ill.

Now you can purchase your chairs with Wittliff Braces from The Tell City Chair Co., Tell City, Ind.

Section VII

HOME ECONOMICS—CAFETERIA—LAUNDRY

Equipment and Use of the Home Economics Department of a Modern School

BY ILA T. KNIGHT

DIRECTOR, HOME ECONOMICS DEPARTMENT, NICHOLS INTERMEDIATE SCHOOL, EVANSTON, ILL.

OUR home economics department has recognized that a love of beauty is the primal instinct of man. Good taste is the love of beauty instinct trained. The color harmonies, beautiful lines, and pleasing proportions of the home economics rooms in the new Nichols School will accomplish much in the training of the little potential housewives of Evanston who cook, sew, and clean within this happy domain. The attractive laboratories and housekeeping suite have contributed in no small way to the interest and enthusiasm which the children themselves have now come to possess. The modern girl is proud of her ability to cook and sew. Even the girl of independent means is not averse to specializing in one of these branches of household arts. The old jokes about the bride's first biscuits and idle boasts of helplessness have been relegated to the archives.

All 6B, 7B, and 8B classes have an hour-and-a-half period a week in cooking; while the 6A, 7A, and 8A groups have sewing. For an elective they may also choose home economics subjects. Even the boys come in for their share of training in an elective under the title "Camp Cooking." The boys prepare one dish and then select proper foods to complete the meal from the cafeteria.

Our entire suite includes the domestic science room, a dining-room, a bedroom, a bath, and a sewing room. The domestic science room is the largest of these. The walls of this room are finished in an ivory color with a soft green for poster boards.

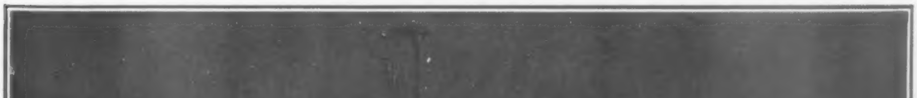
Cooking Laboratory and Food Classes

The room is equipped to accommodate a class of 32 girls. The maple-top desk cabinets contain cooking utensils for four girls. Between the desks are the small four-hole gas ranges with ovens. There is also an unusually roomy pantry for extra utensils and supplies, and a regular cleaning closet for our cleaning devices, with several drawers for towels and linen. The compact kitchen unit of kitchen cabinet, electric range, electric refrigerator, sink, and work table, all of which

Perspective drawing by Childs & Smith, Architects, Chicago

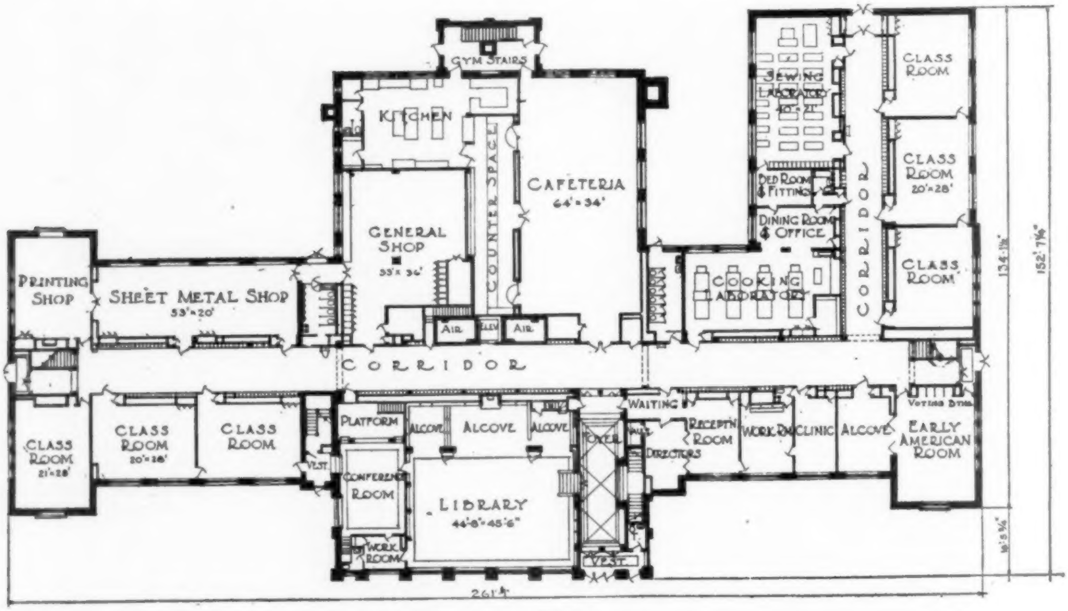
THE NICHOLS INTERMEDIATE SCHOOL, EVANSTON, ILL.

MAIN ENTRANCE LOBBY OF THE NICHOLS INTERMEDIATE SCHOOL



Photographs by courtesy of Childs & Smith, Architects, Chicago

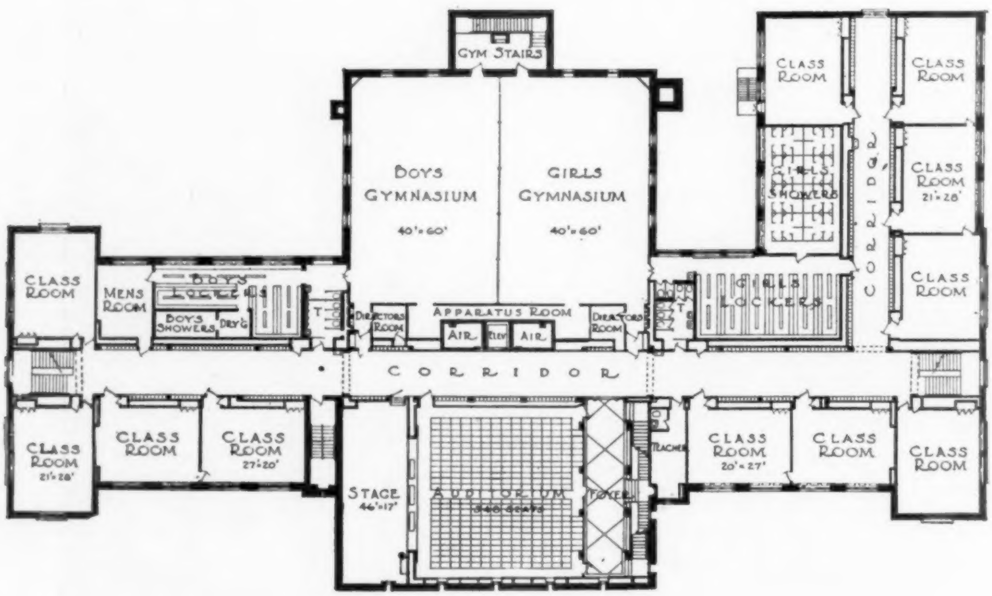
EARLY AMERICAN ROOM IN THE SCHOOL



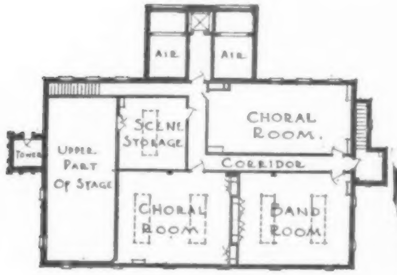
• FIRST · FLOOR · PLAN •

occupy one end of the cooking laboratory, are convenient for food preparation in meal-planning classes, as well as in the regular classes.

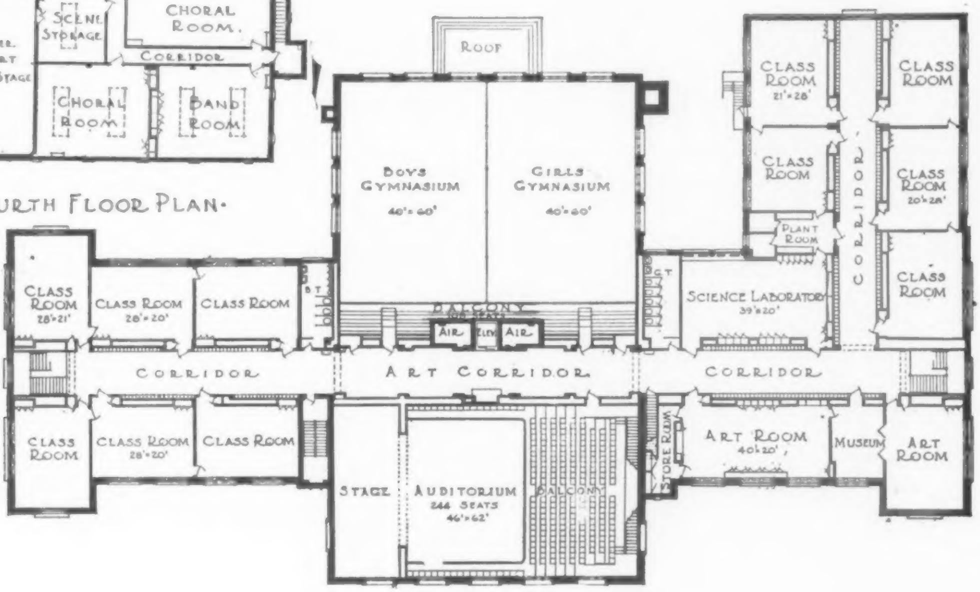
The points stressed in the food classes are the selection of foods, their value in the body, wholesome preparation, serving, and cost. In the 6B groups we emphasize food values to the body in each lesson. Much more emphasis is placed upon selection of food than upon methods of cooking. Neat and sanitary methods of work, and scrupulous cleanliness of person and utensils are especially stressed here, in order that right habits may be formed in the beginning. The basis for the choice of foods cooked in this grade is the breakfast and simple luncheon. Near the end of the semester the class prepares and serves a breakfast or luncheon, whichever is most convenient for the class period of that particular group.



SECOND · FLOOR · PLAN.



•FOURTH FLOOR PLAN•



• THIRD • FLOOR • PLAN. •

In the 7th and 8th grades our aim is to promote home helpfulness, form right health habits, and awaken an interest in the economics of food and efficiency in household management. Cooking lessons are planned to give experience in the selection and preparation of the luncheon and dinner.

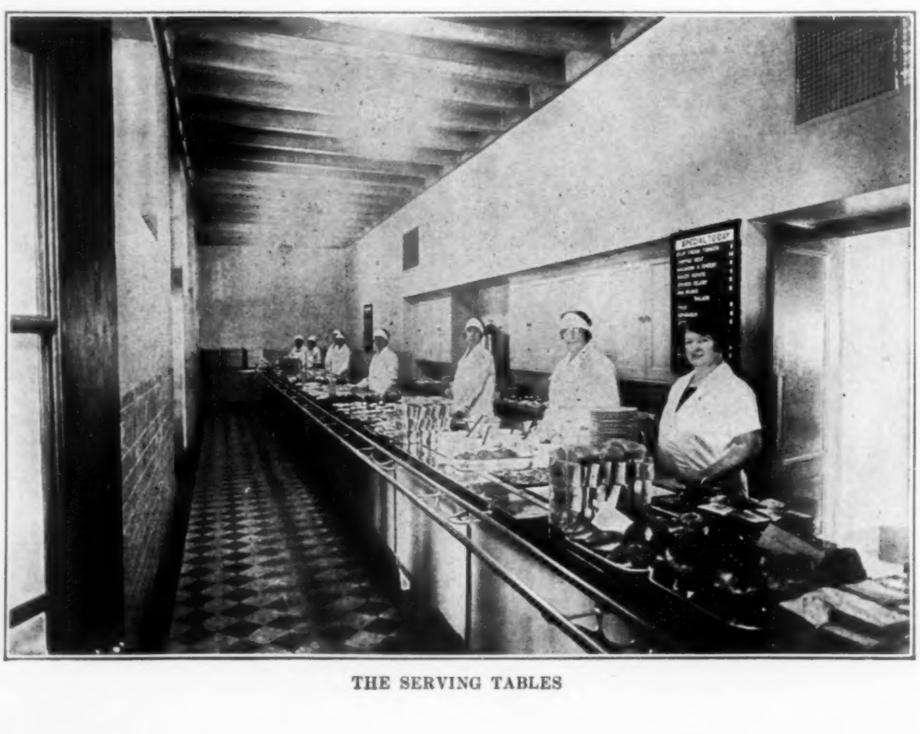
The use of standard recipes gives the girls power to adjust and vary these to meet the needs and tastes of their individual families, and thus it is not necessary to include a large number of recipes. For example, the standard recipes for white sauce are developed in one lesson, then the

PRACTICE DINING-ROOM OF THE NICHOLS INTERMEDIATE SCHOOL

BEDROOM, USED FOR COMBINATION FITTING ROOM, OFFICE AND HOME NURSING

THE CAFETERIA

girl has the foundation knowledge for making all cream soups, gravies and cream custards. Several lessons are spent on preservation of foods. The girls are rightfully proud of their jellies, preserves, and canned fruits. After the series of baking lessons, which include foundation recipes for hot breads, cakes, pies, and yeast bread, the girls develop a noticeable amount of confidence in their ability to do more than "play house." Nine 8th grade girls prepared and served a dinner for our Board of Education which would have been praised by the most critical of chefs. Two



THE SERVING TABLES

THE COOKING LABORATORY

luncheons or dinners are prepared by each 7th and 8th grade group during the semester.

Dining-Room Equipment

The dining-room adjoins the cooking laboratory and is decorated in a bright figured paper with green as the main color theme. The drapes are a soft orange, and the dining-room furniture, which would be suitable for a home, is a deep green edged with orange. The table top is shiny black and is indeed lovely when set with our Italian lace luncheon set. The colorful glassware, china,

THE SEWING ROOM

and silverware serve many groups in the various courses. The dining-room facilitates training in serving teas, luncheons, formal and informal dinners.

The meal-planning class, an elective course, is always a source of great interest. The group of twelve girls plans, prepares, and serves its own luncheon. This necessitates careful budgeting of time and money. Each girl pays 20 cents for her luncheon. The girls take turns in filling the places of hostess, waitress, and cook. This also provides experience in marketing, as the cooks are responsible for the supplies. Each week the menu is planned to bring out a different problem of diet. One week the menu is a meal to gain weight, then the next a filling meal of low caloric value. The different types of service are also introduced, stressing the English style where the daughter can be of great assistance to her mother.

Bedroom and Bathroom

The bedroom, charming with its apple-green painted furniture against the ivory paneled walls, connects with a tiled bathroom. The drapes and bedspread are of lustrous green rayon material with a touch of rose trimming. The chest of drawers and mirror are effectively accentuated by tall mirrored lamps with rose shades. The floor covering is a neutral beige rug.

This room is ever in demand, as the mirrored door makes it an ideal fitting-room for our sewing classes. The home nursing classes practice bed-making here, care of the sick, and sanitation problems. The home management class uses this room for a study of interior decoration, the placing of furniture and pictures, and a laboratory for all cleaning devices and methods. Each girl plans the furnishings of a room on a limited amount of money. They also plan their personal budgets for a period of three months. Adjoining the bedroom is a spacious sewing laboratory for the use of the regular sewing classes. The girls of the 6A groups learn to do the different stitches by making their own equipment for the cooking laboratory. The hand towels are problems in hand sewing, while making the hot pan holders enables them to learn to operate a sewing machine and do straight stitching. The aprons familiarize them with commercial patterns, and they should know how and where the textiles they use in class were obtained, how to judge their quality, and how to buy them intelligently.

The 7A group selects a suitable design for cutting and making simple underwear garments. Each member of the 8A group makes careful study of colors and lines and then designs and makes a dress for herself. Neat rows of drawers at one end of the room hold the sewing equipment of each seamstress. Problems of laundry and removing stains also have their place in this work, therefore there are a washtub and an ironing board in the laboratory. Six oak-top tables are in our laboratory, two having the drop-leaf extension for cutting. Eight sewing machines, four of which are electric, are also included.

During the week approximately 500 girls come into these beautifully designed and practically furnished home laboratories.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

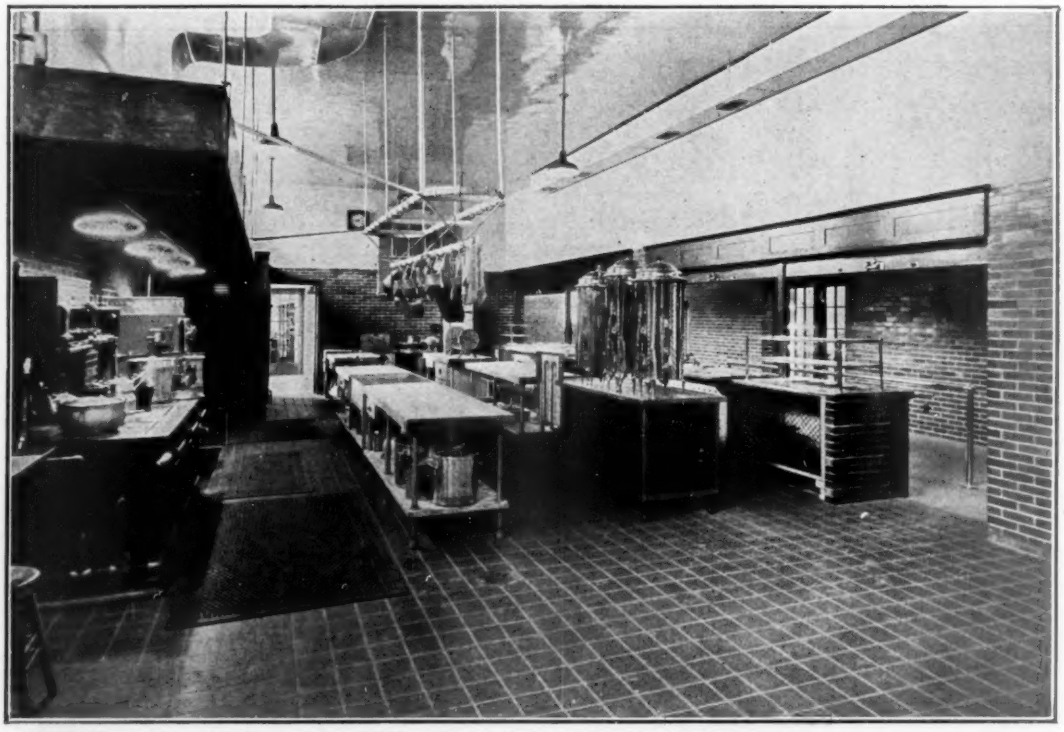
Auditorium Seats—American Seating Co.
Boilers—Kewanee Boiler Co.
Cafeteria Equipment—The Stearnes Co.
Cafeteria China and Glassware—Burley & Co.
Clocks and Signal Systems—International Time Recording Co.
Cooking Laboratory Utensils—Marshall Field & Co.
Cooking Laboratory Equipment—E. H. Sheldon Co.
Curtains and Drapes—The Davis Co.
Drinking Fountains, Plumbing Fixtures, Sanitary Equipment, Showers—James B. Clow Co.
Fans—Buffalo Forge Co.
Furniture of Special Rooms and Administration Offices—Phoenix Chair Co.
Gymnasium Equipment—Fred Medart Mfg. Co.
Heating Regulating System—Johnson Service Co.
Library Equipment—W. M. Welch Mfg. Co.
Lighting Globes and Fixtures—MacBeth-Evans Glass Co.
Linoleum Flooring—Bonded Floors Co.
Lockers—Durabilt Steel Locker Co.
Painting (Decorative)—Christ Christensen
Piping—National Tube Co.
Refrigeration Equipment—Frigidaire Corp.
Stage Equipment—Acme Scenic Studios
Stage Lighting Equipment—Chicago Stage Lighting Co.
Valves—Crane Co.
Venetian Blinds—Mackin Venetian Blind Co.

For a general discussion of Layout and Equipment of High School Cafeterias, see the article on this subject by Willard S. Ford, Ph.D., Professor of Education, University of Southern California, on pages 277-281 of The American School and University for 1928-1929.

THE NEW FORDSON HIGH SCHOOL, DETROIT, MICH.

CAFETERIA OF THE FORDSON HIGH SCHOOL

CAFETERIA OF THE NEW JEFFERSON HIGH SCHOOL, LAFAYETTE, IND.



Photographs on this and the preceding page by courtesy of the Albert Pick-Barth Companies

KITCHEN OF THE JEFFERSON HIGH SCHOOL

The Functions of a School Laundry

By GEORGE B. HOLLISTER

NEARLY all kinds of educational institutions, from the large university to the elementary school, except the small day type, will find the installation of their own individual power laundry worth careful consideration, in case such a laundry department is not already in operation.

Of course, any school having resident students must provide some means of washing the wearing apparel of the pupils, as well as of doing up their bed linen, table linen, napkins, towels, etc.; but now that the larger high schools are installing gymnasiums, swimming pools, and cafeteria equipment, it has been found most economical, even in this type of day school, to have a small laundry plant which will take care of bath towels, bathing suits, athletic suits, uniforms, napkins, etc. By having an individually operated laundry plant these articles can be laundered at a considerable saving of expense, and the convenience of doing this work inside of the building must also be considered.

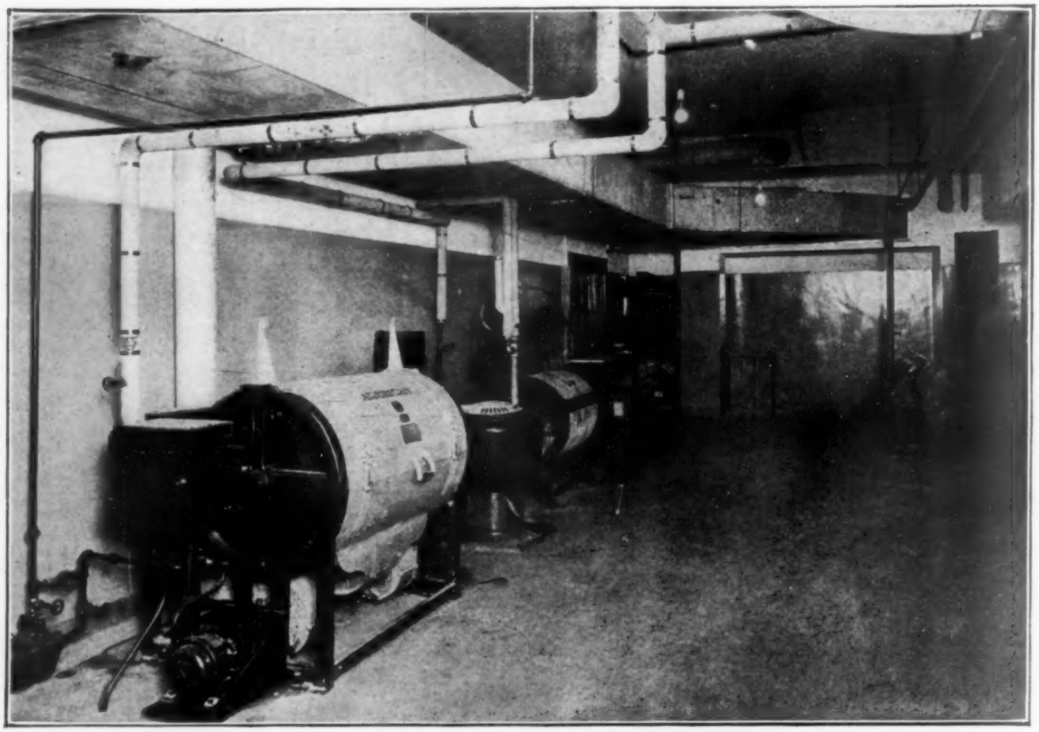
Many representative American universities such as the University of Pennsylvania, the University of Michigan, Notre Dame University, and Vanderbilt University, operate their own laundries. They enjoy the convenience of getting their linens done promptly and of being able to keep smaller supplies of linens in stock than would otherwise be possible. In addition, the profits derived from handling the laundry work of the students in the university plant are found in many cases to cover the complete cost of operation. Other schools, such as the United States Military Academy at West Point, the Naval Academy at Annapolis, and various well-known boys' and girls' preparatory schools throughout the country, are also finding that doing their own laundry work is a decided asset for these same reasons.

Many schools have put off the installation of laundry equipment because they figured that this would run up into a large expenditure of money, but there is available small "group drive" equipment which comes easily within the reach of the smaller institution. This consists of a small wood washer, an underdriven extractor, a "junior" drying tumbler, and a single-roll flat-work ironer. A photograph of such an installation in the Central Junior High School of Kansas City, Mo., is shown on page 338.

On the other hand, a large university, such as the University of Michigan, has a laundry which is comparable in modern equipment with some of the metropolitan commercial laundry plants.

A laundry is practically a necessity in any institution where a considerable amount of flat work or wearing apparel is used, and it will be found well worth while for the superintendent to investigate this matter when figuring estimates on the coming operating year.

For a discussion of other provisions for sanitation and cleanliness in educational buildings, see pages 61 to 63 and 131 to 145 of this issue.



SMALL-CAPACITY LAUNDRY EQUIPMENT, CENTRAL JUNIOR HIGH SCHOOL, KANSAS CITY, MO.

Photographs by courtesy of the American Laundry Machinery Company

LAUNDRY EQUIPMENT AT THE UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH.

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OAKLEY, CINCINNATI, OHIO

DIVISION OF ALBERT PICK-BARTH COMPANY, INC.

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LORILLARD REFRIGERATOR COMPANY

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CAFETERIA IN THE FORDSON HIGH SCHOOL, FORDSON, MICH.
Designed and Equipped by VAN Engineers

PRODUCTS

For seventy-five years the John Van Range Company have been manufacturing equipment of the highest grade for the preparation and serving of food. This is one of the reasons why VAN Cafeteria and Kitchen Equipment is the recognized standard in the educational field, just as it is in the hotel, club, restaurant, and hospital fields. Everything in equipment required for school cafeterias and kitchens is provided by this company including cafeteria counters, steam tables, coffee urns, water coolers, bakery equipment, complete kitchen equipment and Lorillard Refrigerators.

ALBERT PICK-BARTH COMPANY, INC., 1200 West 35th Street, Chicago, and 34 Cooper Square, New York, of which John Van Range Company is a division, provides everything in furnishings and supplies for schools, colleges, dormitories and camps. This includes chinaware, glassware, silverware, linens, bedding, furniture of all kinds, floor coverings and janitor supplies. Every school should have the Pick-Barth Catalog K-32.

PLANNING

In planning your school, be sure that your architect provides plenty of space for the cafeteria in a light, airy location. This should be easy of access for delivery of food supplies. If in doubt about this important question, send preliminary plans or blue prints to any of the Sales

CAFETERIA KITCHEN IN THE JEFFERSON HIGH SCHOOL, LAFAYETTE, IND.
Designed and Equipped by VAN Engineers

Offices listed above and our engineers will be able to make constructive suggestions.

The actual planning of the school cafeteria is a task that requires the services of a skilled kitchen engineer with whom your architect will consult. Every school has its own individual requirements based upon size, location, community, attendance, age of pupils, etc. — hence the cafeteria should in each instance be specifically designed to meet your school's particular needs. Our engineers are available for consultation on these problems.

The first cost of equipment is important —but so is the *operating cost.* You will find VAN Equipment low in original cost and lastingly economical. It is adaptable to any plan and any budget.

ENGINEERING CONSULTATION SERVICE

You will find that it will save you money to consult VAN engineers regarding the food serving facilities for your school. They are particularly fitted to handle this important work because of years of experience in this field. They will advise you as to the type of equipment needed and the most efficient cafeteria layout for your school's requirements. Their advice may save you hundreds of dollars and may prevent needless waste in your plans.

A NEW BOOK ON SCHOOL CAFETERIAS

We have just published a new 32-page book covering all phases of planning school cafeterias and their equipment requirements. This booklet is based on our many years of experience in this field and every school executive and architect interested in school planning should have a copy. Ask for School Cafeteria Booklet K206.

KITCHEN IN AVON COLLEGE, AVON, CONN.
Designed and Equipped by VAN Engineers

WESTINGHOUSE ELECTRIC AND MFG. CO.

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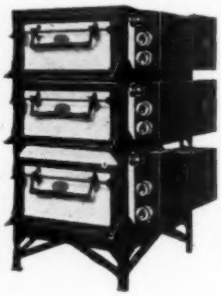
Offices in all principal cities throughout the United States

BAKE OVENS

Combination Meat Roasting and Bread Making

The Westinghouse combination oven represents the ideal baking and roasting equipment for educational institutions. By the sectional construction individual sections may be utilized as desired for the baking of bread, cake, pastry and meat products. Automatic temperature control is a feature of these ovens and separate control of the top and bottom heater in the individual sections. Any combination of a three-section oven can be supplied, including one or more meat roasting sections as desired.



Additional sizes of bread and pastry ovens, including the 40 and 60 loaf sections as standard, can be supplied. Special sizes built to order include the 90, 120 and 200 loaf sections in two-section ovens.

HOTEL TYPE BROILER

The Westinghouse hotel type broiler is identical construction to the range in that the heavy sheet-steel frame is utilized, broiler being particularly constructed to meet severe service in educational and other institutions.

The broiler is made in two sizes, the larger size of which can be supplied either with or without a separate roasting oven mounted in the base. This roasting oven is a very desirable feature as no additional floor space is taken up for this necessary item, which is a duplicate of the oven in the large hotel type range and can be supplied either with automatic or non-automatic control of temperature.

Both sizes of broiler are provided with an insulated Au Gratin oven mounted above the broiling area and forming a part of the broiler frame. This oven has a cast-iron floor plate and while the broiler is in operation can be utilized for many baking and roasting purposes.

The large size broiler has three separate broiling elements each separately controlled by a three-heat switch for various broiling temperatures. The smaller broiler has two separate elements and other than the change in dimensions is of identical construction.

The large broiler has a capacity of 72-pounds of steak per hour.

HOTEL TYPE RANGES

The Westinghouse hotel type range was particularly built to meet the requirements of educational institutions. This range is made entirely of heavy steel with all joints welded and is built to give lasting service over an indefinite period.

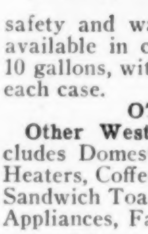
This range is capable of turning out more work than a given size of fuel-fired range thus saving labor and floor space. The number of meals served from the standard 4 ft. range will vary from 150 to 300 per meal. A good average would represent 200 people per meal.

A hotel type range is made in two sizes, the standard 4-ft. section and the Utility Range, which is a 3-ft. section. Either size is provided with or without separate insulated roasting oven mounted in the base. The oven has an automatic or non-automatic temperature control, as desired.

The large range has four top-cooking plates of heavy cast-iron with imbedded heating elements. The Utility Range has two cooking plates. All plates measure 12" x 18" and are under separate three-heat control. The cooking plate has been particularly designed to accommodate the average cooking utensil for maximum efficiency.

ELECTRIC COFFEE URN

The Westinghouse electric coffee urn is a combination hot water and coffee urn of two separate compartments. The urn is very simple in operation and of a very rugged "fool-proof" construction. A particular feature of this urn is the automatic re-pouring feature enabling the operator to make his coffee complete without exposing same to outside air with consequent losses of flavor, etc. All the delicate aroma of the coffee is retained and the amount of coffee required to secure proper strength is consequently reduced. Any possible bursting or collapsing from careless handling is prevented by a special combination safety and water relief valve. These urns are available in coffee capacity of 2, 3, 4, 6, 8 and 10 gallons, with the water capacity double that in each case.



OTHER EQUIPMENT

Other Westinghouse electrical equipment includes Domestic Automatic Ranges, Coffee Urn Heaters, Coffee Urn Stands, Griddles, Hot Plates, Sandwich Toasters, Steam Tables, Waffle Bakers, Appliances, Fans and Lighting Equipment.

For Micarta Trays see page 460; for Lighting see page 129; for Panelboards see page 460.

Section VIII

LABORATORY AND SHOP

The Selection and Purchase of Equipment and Furnishings for Laboratories

BY S. R. POWERS

PROFESSOR OF NATURAL SCIENCE, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

THE demands for equipment and furnishings for laboratories, particularly those for the secondary school levels, should be interpreted in the light of the new and enlarged conception of the objectives of secondary education and, in particular, of high school science. During the past decade there have been several reports of intensive studies of outcomes of laboratory instruction. Downing[1] and his students and others working independently have demonstrated fairly conclusively that the method of teacher demonstration is as effective as, and more economical of time than, the usual method of individual laboratory work for training students so that they may pass the traditional informational examination. Horton[2] has demonstrated equally conclusively that through use of a modified form of individual laboratory work, students may be trained in laboratory technics and in problem solving. These and related studies suggest the new interpretation of problems of equipment and furnishings.

Two conclusions may be safely drawn from these studies. First, there must be larger provision for demonstrations, and, second, the equipment for individual work must allow for greater flexibility in methods of teaching. The student should have the facilities for doing other things than those set forth in the traditional list of exercises described in the laboratory manual. The demands are reasonable in that the practical school man may easily meet them.

The size of the school also has an important bearing upon laboratory plans. In small to medium-sized schools the combined laboratory and classroom is in favor. Rooms may be equipped for more than one science. A very careful planning is

[1] Downing.—Teaching Science in the Schools, Chapter VIII. University of Chicago Press.

[2] Horton.—Outcomes from Laboratory Instruction in High School Chemistry. Teachers College Contributions to Education No. 303.

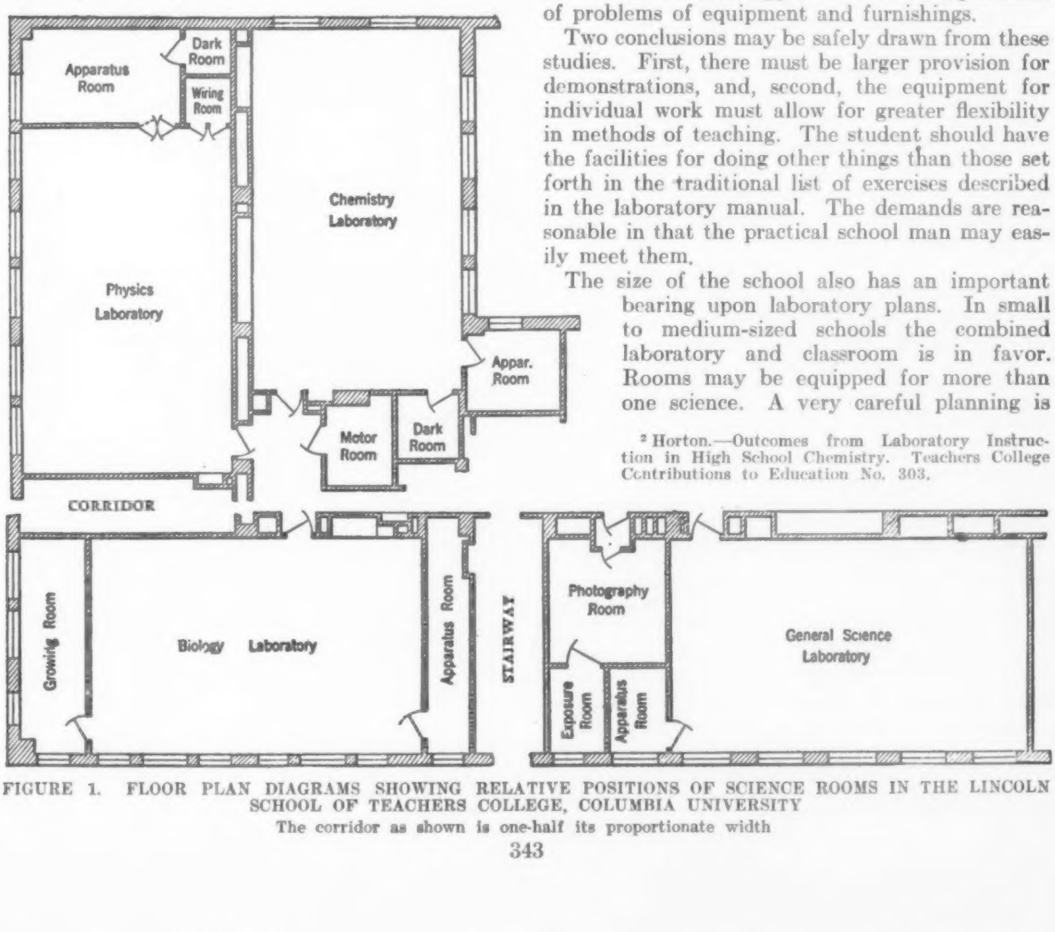


FIGURE 1. FLOOR PLAN DIAGRAMS SHOWING RELATIVE POSITIONS OF SCIENCE ROOMS IN THE LINCOLN SCHOOL OF TEACHERS COLLEGE, COLUMBIA UNIVERSITY

The corridor as shown is one-half its proportionate width

illustrated in the floor plans of the science laboratories of the Milwaukee University School designed by W. R. Leker. These plans are shown in this volume (page 352). In the Lincoln School of Teachers College, separate rooms planned as combination classrooms and laboratories are arranged for each of the sciences of the secondary school. The arrangement of rooms is shown as Figure 1. In large schools, for example the Roosevelt High School of New York City, there are separate recitation rooms and laboratories as well as store and preparation rooms. Floor plans of the rooms set apart for Physics are shown as Figure 2. The arrangements for chemistry and biology are similar.

Rooms designed for science work are incomplete without equipment for visual education. Dark shades and projection apparatus for slides and 16-mm. films are essential equipment.

Minimum lists of equipment for each of the sciences are available from many sources. These are fairly uniform in their recommendations. A summary of these, together with other recommen-

There should be a wall table carrying fixtures for gas and electricity, and there should be wall sinks, one for each eight students. A laboratory planned for 32 students should have four sinks. This plan of equipment is economical of floor space and it allows for the degree of flexibility that is demanded for proper work in this subject.

The divided classroom with provision for laboratory work at one end and recitation, discussion, and demonstration work at the other, has not generally met with favor among general science teachers nor administrators, nor has the plan of a classroom with fixed chairs or desks. A separate laboratory specially equipped for individual laboratory work is not generally advised.

In modern schools liberal provision is made for apparatus for demonstrations and for displays. The course of study will guide in the selection of material. Analysis of instructional material shows that course of study content may be conveniently considered under a few large headings. James M. Glass[4] sets forth eight headings in his monograph on curriculum practices in the Junior High

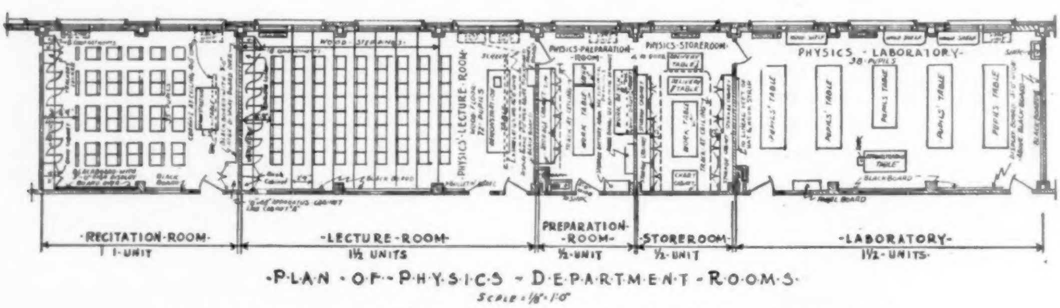


FIGURE 2. ARRANGEMENT IN ROOSEVELT HIGH SCHOOL, NEW YORK CITY

dations for laboratory equipment, is contained in a recent bulletin[3] of the United States Bureau of Education.

The sequence of science courses recommended by the Commission on Reorganization of Science in Secondary Schools, which has general acceptance throughout the United States is:

Junior High School or Ninth Grade, General Science
Tenth Grade, General Biology
Eleventh Grade, Chemistry or Physics
Twelfth Grade, Physics or Chemistry

General Science

Most acceptable practices in the teaching of general science seem to demand that the room be furnished with a well-equipped demonstration desk, and movable tables at which the students may sit during demonstration and class discussion and at which they may work on assignments, problems or projects which require either book work or the manipulation of tools or laboratory apparatus.

[3] Monahan.—Laboratory Layouts for the High School Sciences. Bureau of Education Bulletin, 1927. No. 22.
See also Standard State Lists of High School Laboratory Equipment. Central Scientific Co., Chicago, Ill.

School; and Elliot R. Downing[5] reports the results of analysis of 25 textbooks in a more detailed table of 20 headings with many subheadings. These analyses will be useful guides in planning equipment.

Authors of textbooks commonly give a minimum list of apparatus.[6] The apparatus in these lists is recommended for first purchase. Progressive schools, that is, those guided by a desire to provide for their children experiences which will be as rich as possible, will provide more than the minimum list. The following pieces are recommended:

[4] James M. Glass.—Curriculum Practices in the Junior High School and in Grades 5 and 6. Supplementary Educational Monograph No. 25, University of Chicago Press. Quoted in Department of Superintendence Fifth Year Book, p. 147.

[5] Downing, Overn, Iler, and Heinemann.—An Analysis of Textbooks in General Science. General Science Quarterly 12:509-515, May, 1928.

[6] As illustrations of these see:
Teacher's Guide Book for Everyday Problems in Science, by Pieper and Beauchamp. Scott Foresman & Co., Chicago, 1927.
Teacher's Manual for Modern Science Series—Book III, Our Environment, How We Use and Control It, by Wood and Carpenter. Allyn & Bacon, Boston, 1928.
Monahan: Laboratory Layouts for the High School Sciences. Bureau of Education Bulletin, 1927, No. 22, pp. 29-30.

1. Motor-driven air pump. The combined vacuum and pressure pump is especially recommended. The pump should be selected for rapid action rather than for extremely low pressures.
2. Barograph, recording barometer.
3. Thermograph, recording thermometer.
4. Apparatus for energy transformations. Water motor, steam engine, dynamo and milli-ammeter.
5. Models of automobile parts. Chassis and engine.
6. Models of human eye.
7. Models of human ear.
8. Telephone transmitters and receivers.
9. Voltmeter, ammeter, and watt-hour meter, commercial forms, which may be connected directly to the service line of the laboratory.
10. Compound microscope and Euscope projector.
11. Aquarium fed with running water.
12. Induction coil.
13. Models, charts and specimens of selected plant and animal forms.
14. Planetarium showing earth's motions in relation to sun and other planets.
15. Globe (earth).
16. Rock and mineral collections.
17. Astronomical telescope.
18. Radiometer.

General Biology

The room set apart for biology should be a combined classroom, laboratory, and museum. Furnishings will include a well-equipped demonstration table, movable tables large enough to accommodate two or four students, wall table space with gas and electricity, and sinks at walls, one for approximately eight students. Standard minimum lists of apparatus have been prepared by the authors of most of the texts and laboratory manuals,[7] and the pieces listed in these are items for first purchase. The following pieces are recommended for schools which are able to purchase in excess of the minimum.

1. Compound microscope and Euscope for microprojection.
2. Models, specimens, and other displays selected to illustrate biological phenomena and biological principles.
   a. Structure of monocotyledonous and dicotyledonous stems.
   b. Animal forms illustrating increasing complexity of structure.
   c. Structure of human eye, ear, head, chest, and abdomen.
   d. Displays illustrating animal and plant life, such as community life of insects, protective coloration, Mendel's laws, life histories, etc.
   e. Charts selected to illustrate phenomena and principles like those above (a to d).
3. Aquarium fed with running water.

Adjoining the laboratory should be a growing-room with furnishings, including aquaria, terraria and cages. The room must have abundance of natural light and should have outlets for electric lighting. There should be no gas in this room. In large schools with more than one laboratory, the growing-room will be centrally located and accessible to all laboratories. The diagram of the laboratories of the Milwaukee University School shows a plan for a combined biology and general science room which has many points in its favor for the smaller schools. The fixed desks do not allow for the kind of flexibility that is demanded by teachers who specify movable tables.

Chemistry

Three distinct types of laboratories are recognized for chemistry. There are those of the so-called Lincoln type, used in the Lincoln School of Teachers College, in which the student uses the same space for laboratory and for recitation work. The second is the divided room, one part for laboratory and one part for recitation. This is illustrated in the plan shown as Figure 3. The third is the case in which two rooms are used,

[7] See, for example, Student's Manual of Exercises in Elementary Biology, by Gruenberg and Wheat. Ginn & Co., 1921; Monahan: Laboratory Layout for the High School Sciences, *loc. cit.*, pp. 28-29.

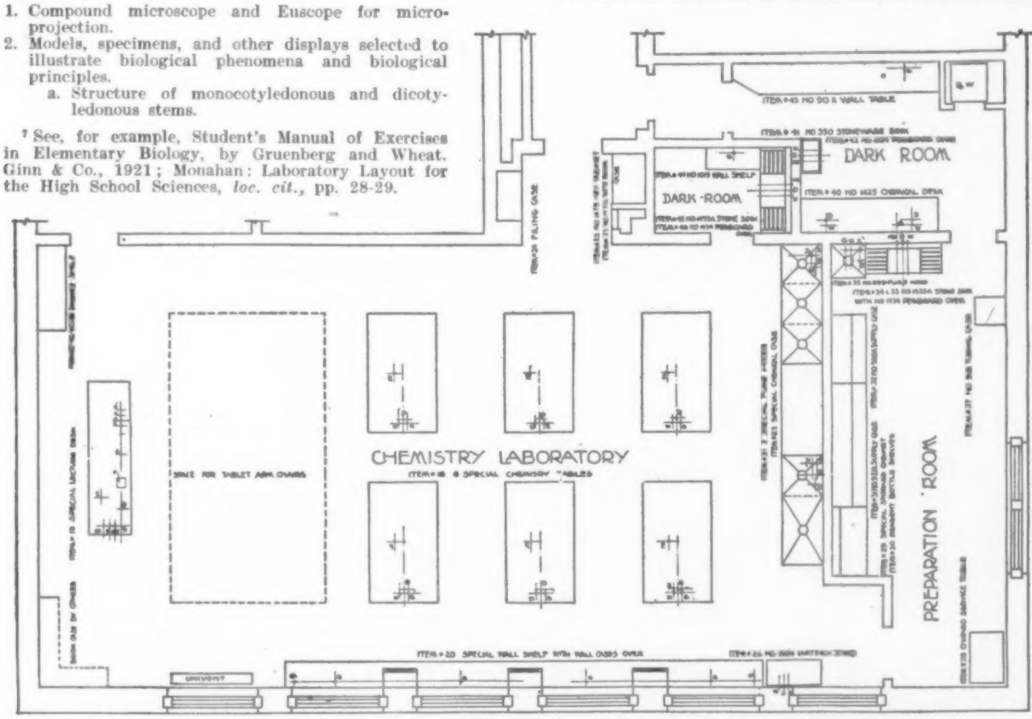


FIGURE 3. FLOOR PLAN, CHEMISTRY DEPARTMENT, FIELDSTON SCHOOL OF THE SOCIETY OF ETHICAL CULTURE, NEW YORK CITY

Generally conceded to be a most carefully designed and beautifully equipped school

one, only as a laboratory, and the other only as a recitation room. No one of these can be called best, unless its merits are considered in relation to the size of the school and the plans of the instructor. Common practice finds the Lincoln type and the divided room about equally in favor for the small to medium-sized school. In very large schools the separate laboratory and classroom are preferred. Figure 3 shows a carefully planned arrangement for large schools.

In either case the room in which class discussion is carried on should be well equipped for demonstration work. Service to the demonstration tables should include water, gas and direct-current electricity. Student tables should carry gas and water.

The minimum list of apparatus as given in laboratory manuals[8] should be purchased to meet minimum requirements. The method of individual laboratory work is used extensively in chemistry. In this the work should be planned so that so far as possible the students are independent of each other and of the storeroom. Student kits may be made up so that they are complete for a semester's work. For schools that wish to provide more than the minimum requirements, the following items of equipment are recommended:

1. Analytical balance—medium-priced but with sensitivity to one-tenth milligram
2. Distilling apparatus for water
3. Electrolysis apparatus—Hoffman form
4. Eudiometer—Hoffman form
5. Induction coil for exploding gases
6. Liebig condenser for fractional distillation
7. Combustion furnace, electric
8. Apparatus for producing liquid air
9. Chart of the Atoms—Bureau of Standards form

The chemistry teacher may properly take as an objective of the demonstration, to show some refined method of laboratory work which has application in research or in industry. The special training of the teacher will guide in the selection of apparatus for this work.

Physics

The three types of laboratories recognized for chemistry are also recognized for physics, and the same considerations will determine choice.

The course of study or the manual selected for use[9] will determine the selection of apparatus for student use. Student tables will be equipped with gas and electricity. Water should be available from wall sinks, one sink for each eight students. Electricity should be supplied from a panel board and should include service lines from lighting circuit, from motor-generator, and from storage batteries.

The demands for demonstrations are probably larger than in any of the other sciences unless perhaps general science. A steel beam close to the ceiling and over the demonstration table should be provided for suspending heavy weights. The demonstration table should be equipped with water, gas, and electricity. The electrical service should include current from the lighting circuit, from motor generator, and from storage batteries.

Apparatus for demonstration should include items numbered 1 to 10 inclusive, in the general science list and the following:

1. Metric Chart, Bureau of Standards form
2. Chart of the Atoms, Bureau of Standards form
3. Acceleration apparatus
4. Motor rotator and attachments
5. Gyroscope, Foucault form
6. Pascal's vase apparatus
7. Boyle's law apparatus and air thermometer
8. Gas meter with large dial for easy reading, commercial form
9. Dissectable hand power dynamo
10. Galvano-volt ammeter
11. Optical bench with attachments
12. Optical disc
13. Astronomical telescope (3-inch)
14. Static machine, Wimshurst ambrolite plates
15. Foot-candle meter

The physics teacher should be encouraged to develop demonstrations of considerable refinement in the field of his special interest, and for this special apparatus will be required.

In addition to laboratories there is need for a room or rooms which shall be combination preparation and store room. Medium-size and large schools will require at least two such rooms—one for general science and biology, and one for physics or chemistry. Furnishings and equipment should include benches and tools for wood and metal work. The service to the room should include gas, water, electricity, and air pressure for a blast lamp. Air pressure may be supplied by means of a foot bellows.

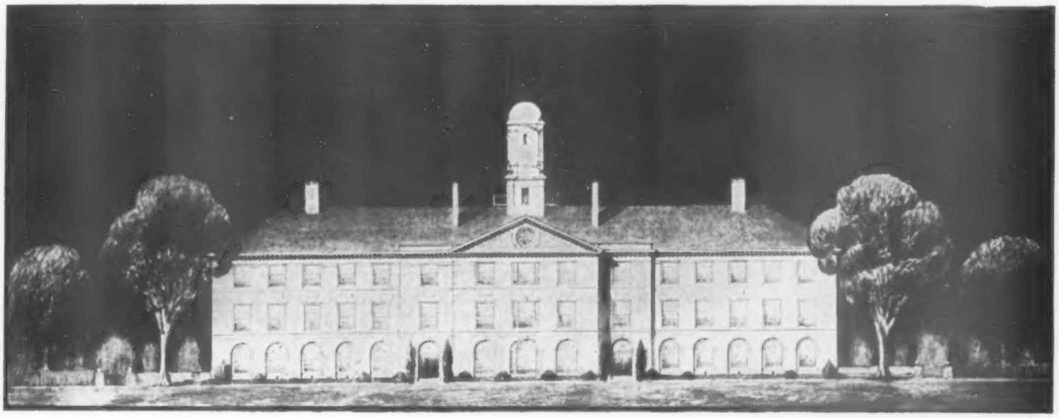
Modern schools will provide for their children a rich experience with science. This will be accomplished by revealing the possibilities of the field through the use of displays and good apparatus for demonstrations and individual work. The lists suggested above do not by any means exhaust the possibilities. Features that are important for their contribution to flexibility are the workshop and dark-room with good supplies of tools. Pupil activity is a natural development in science, as in other subjects, after the field for activity is revealed and after the materials with which to be active are made available to the pupil. There are large possibilities within each of the fields of science.

[8] See, for example, Laboratory Exercises to accompany Elementary Principles of Chemistry, by Brownlee and others; Allyn & Bacon, Boston, 1928. Laboratory Manual of Chemistry, by Bruce; World Book Co., Yonkers, N. Y., 1924. Laboratory Exercises in Chemistry, by Charles E. Dull; Henry Holt & Co., New York. Monahan: *loc. cit.*, pp. 19-22.

[9] See, for example, Laboratory Exercises in Practical Physics, by N. Henry Black. The Macmillan Co., 1924.

BIBLIOGRAPHY

1. THE AMERICAN SCHOOL AND UNIVERSITY, 1928-29, pp. 269-302. American School Publishing Corporation, 1928, New York.
2. MONAHAN.—Laboratory Layout for the High School Sciences. Bureau of Education Bulletin, 1927, No. 22.
3. LEKER.—The Science Laboratories of the Milwaukee University School. May be obtained from the University School in Milwaukee. The Laboratories are also described in this volume.
4. DONOVAN.—School Architecture. Macmillan, New York, 1921.
   Physics and Chemistry, by Arthur L. Jordan, Chapter XVIII.
   The General Science and Biological Laboratories, by Edna Watson Bailey, Chapter XIX.
5. WOODRING, OAKES and BROWN.—Enriched Teaching of Science in the High School. Bureau of Publications, Teachers College, 1928. This is a source book of information concerning supply houses for charts, models and apparatus.



The New Science Building of Berea College

BY GEORGE H. GRAY, A.I.A.
ARCHITECT, NEW HAVEN, CONN.

WITH the opening last year of Science Hall, adequate accommodation has, for the first time in the history of Berea College, Berea, Ky., been provided for teaching and research in the sciences of astronomy, biology, chemistry, geology and physics.

The new building is fireproof, with brick outer walls, three stories and a full basement, about 200 feet in length, 50 feet in width, with an auditorium wing extending beyond this. The entrance to the main floor is from the campus level on the westerly side of the building, while the location on the edge of a ravine makes it possible to have the service entry and practically a full story at the lower level.

General Arrangement

This building has been developed from data accumulated after an exhaustive research and conferences with the most authoritative laboratory heads in the country. The building has been planned about its functions; that is to say, the internal working requirements of the building have been so handled that each technical requirement is located in its proper position in relation to all other requirements, and about these the general structure of the building has been planned. This results in placing in a medium position to the rear two large lecture halls, or auditoriums, one on the first and one on the third floor, and under these in the basement two recitation or small lecture rooms; in a central position in front, other rooms for general use, such as a museum, a library, a quiz room and toilet-rooms (in basement). At either side of these, adjacent to the lecture halls, laboratories and other rooms, are double flights of stairs. At the ends of the building are the main laboratories extending lengthwise of the building, each laboratory having windows on a long side and on one end, thus receiving direct sunlight on the broad side in either morning or afternoon. In the central portion of the building is space which can be subdivided as required for special laboratories, quiz rooms, offices, etc.

This arrangement provides a flight of stairs in each wing and sacrifices a minimum amount of space to corridors. Each group of main laboratories is cut off from the main corridor by a secondary corridor, or a vestibule, with self-closing doors to give greater privacy to the laboratories and to prevent odors or fumes from getting out into the building. As the physics laboratories involve heavy floor loads, they have been placed in the basement and the first story; as chemistry requires special overhead ventilation, it has been placed on the top floor; as biology is most exacting as to light, it has been placed on the second floor, with extra-heavy large windows.

It may here be stated that in planning the laboratories we have been at great pains to get at the fundamental data which should determine the size, the shape, the lighting and the arrangement of the equipment. To arrive at this, in addition to the data furnished by the faculty, the architect, who has had considerable working experience in laboratories, visited the most notable laboratories recently completed in a large number of our best-known colleges and has conferred with those responsible for their building program and maintenance. The rooms have been planned around the requirements, as indicated by the data so accumulated.

Flexibility

A most important and insistent consideration in the plan is that of flexibility. The collegiate department at Berea is relatively young, but is growing rapidly. It was essential to plan the buildings to meet both present and future requirements. It was necessary, however, to fix upon some figure for the ultimate limit of growth, at least so far as the present building program is concerned. The figure set was 1,000 for the collegiate department. The floor space required was arrived at from an analysis of the present enrollment in the various courses, and an estimate of future schedule.

In laboratory work the classes are divided into sections, or shifts, where the curriculum and teaching staff permit, so that the space and equipment are working the maximum number of hours throughout the week. In the figure we used to determine the floor space required, there would have to be three laboratory sections in order to take care of the ultimate number of students, whereas under the existing student-labor system that number of sections was not possible. So the allocation of space shown on the complete drawings does not indicate the ultimate allocation, which will require the entire second and third floors for chemistry and the entire first floor and basement for physics. During the period of growth before reaching the ultimate number of students, the laboratory rooms need not be equipped as such, and will be available as general class and recitation rooms.

Another element of flexibility of the plan is the fact that the building is readily subdivided into several parts, which are planned to be built serially as needs may demand, namely, the westerly half of the central section, the easterly half of the central section, the northerly wing and the southerly wing.

The Arrangement of the Several Floors

We will take up the several floor plans in detail:

BASEMENT

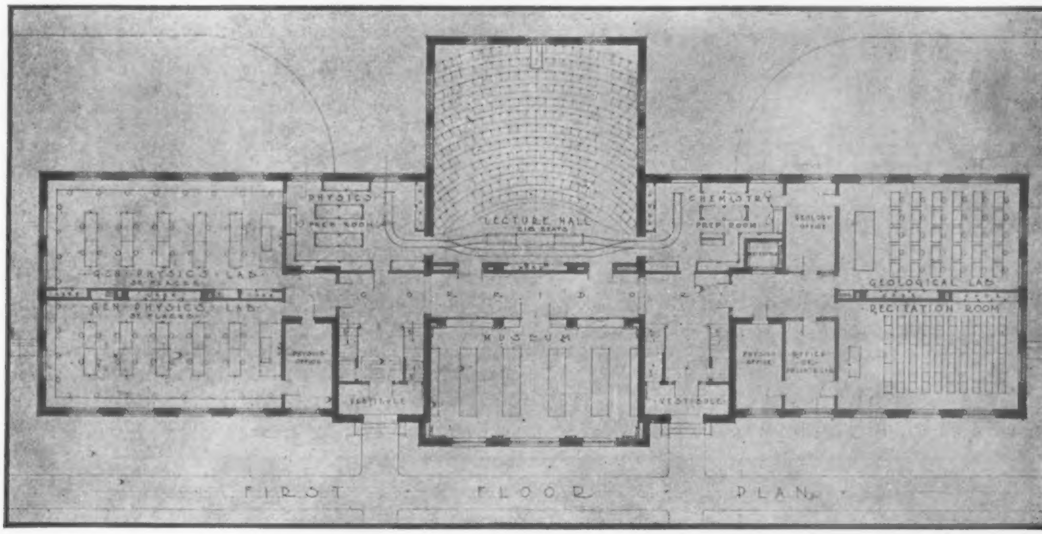
As has been stated, in the basement the east side and the two ends are full stories, with abundance of light. The rooms abutting the west wall have little daylight and are allotted to dark-room laboraries, to storage purposes and to toilet-rooms artificially ventilated. One end is given over chiefly to physics, where dynamos, engines and other heavy equipment may be set up on solid masonry foundations. In the other end are rooms for the department of biology, for aquatic and terrestrial animals, and adjoining these a dark-room laboratory. More centrally located there is a receiving room with an entry from the driveway and a freight elevator serving the three upper floors, in which room apparatus, supplies and equipment for the various departments will be received, uncrated and then stored in stock rooms on the opposite side of the corridor. The storage space is so arranged that two systems are possible: (a) each science department may have complete and independent charge of its own stores; or (b) stores of all departments may be consolidated under one control. In the center of the building are located rooms marked "Battery" and "Utilities," which are the distribution points for various utilities such as electricity for signals, lighting and laboratory purposes, laboratory gas, compressed air and water, switchboards, compressors and manifolds. Here as elsewhere throughout the building, flexibility of plan and equipment is recognized as an important factor. Thus the plan allows for ducts similar to large chimney flues, through which the utilities are to be distributed to the various floors; and which will always be accessible for repairs or desired changes due to future developments in the sciences. (See also description of third floor).

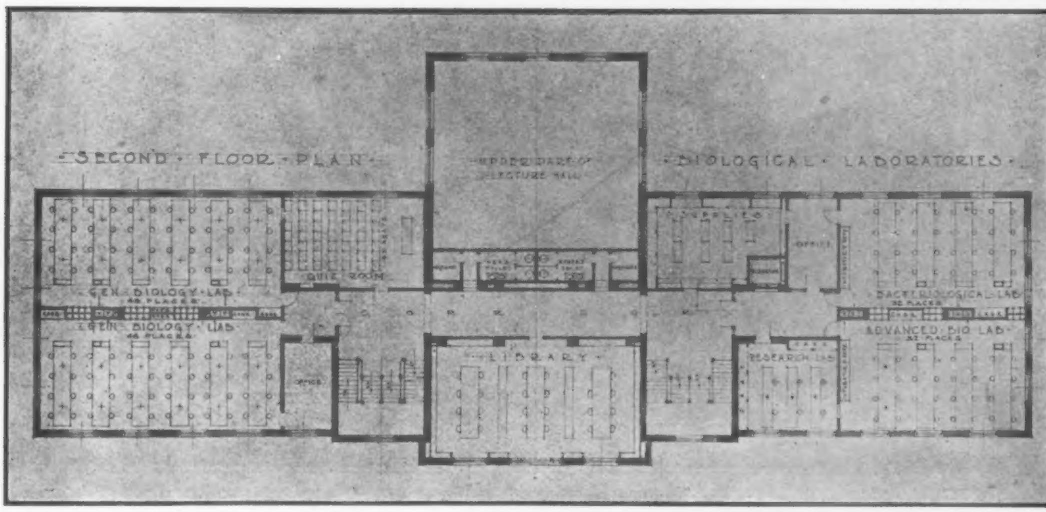
FIRST FLOOR

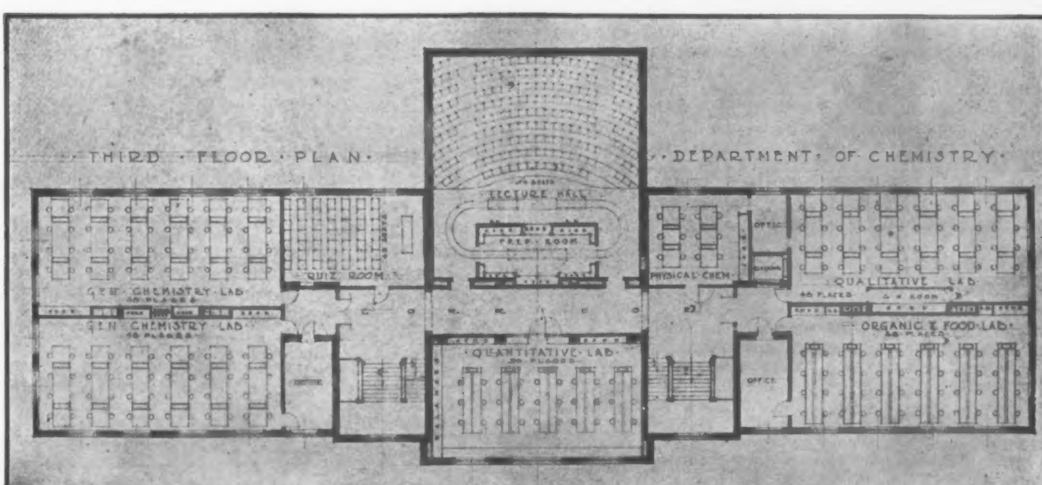
As the museum pertains to all the departments, it is given a central position in the front of the first or main floor. The floor space is well adapted to cases and there is excellent wall space at the ends of the room. It is separated from the corridor by glass partitions and by glass doors. The very large windows along the front are adequate to supply good light even into the corridors. Adjoining the museum on either side is an entrance, with generous vestibule and stairs leading directly to all floors, a double flight to the upper floors and a single flight to the basement.

The principal lecture hall is back of the museum, with 228 seats arranged in concentric tiers, so that each student may have direct vision of the demonstration table. The central portion of the demonstration table is fixed and equipped with all the utilities, various types of electric current, gas, compressed air and water, and at each end of this fixed table are extension tables which can be wheeled into the preparation rooms for physics or for chemistry. The two preparation rooms make it possible for the apparatus to be set up for one lecture while another is under way. Back of the center of the lecture table is a hood, at each side of which is a double tier of blackboards (counterbalanced like double-hung window-sash), and a similar blackboard over the hood and at the far side of the entrance doors. Over the blackboards is space for galvanometers and similar instruments; rolls for a screen in the center and charts at the side. The room extends through the first and second stories, is lighted by means of larger windows at the sides, and is ventilated by the windows and forced draft registers for cold weather.

The general physics laboratories are at one end. A student work-table runs continuously around the outer wall in front of the windows, with several types of electrical currents and compressed air available at all points. A series of ten tables, in pairs, run crosswise of the room, each with the same utilities as the wall tables. At one end of the room on a platform is the instructor's demonstration table, supplied with water in addition to the other utilities; back of the table is a long blackboard, with space over it for galvanometers, etc. At the inner side of the room are cases for laboratory apparatus and a small alcove for a sink. All free wall surfaces are equipped with three continuous horizontal strips of wood at convenient heights for attaching apparatus. Adjoining the laboratories is an office available for the professor of physics. In the physics apparatus and preparation room is generous desk and bookcase space for one or more assistants. On the opposite end of the building is an office available for the head of the department; adjoining it an office available as a private laboratory, or as office in connection with the adjoining classroom. On the opposite side of the corridor is an office available for the head of the department of geology. At this end of the building is a laboratory for geology with individual work-tables for the students and a demonstration table at one end of the room, with blackboard and space for charts and rolls behind it. On the long wall are cases with drawers under them. Adjoining this is a room similar to the geological laboratory, at present allocated to classroom purposes.


PHYSICS
PREP ROOM
LECTURE HALL
CHEMISTRY
PREP ROOM
GEN. PHYSICS LAB
GEN. PHYSICS LAB
GEOLOGICAL LAB
RECITATION ROOM
CORRIDOR
MUSEUM
VESTIBULE
VESTIBULE
FIRST · FLOOR · PLAN


SECOND · FLOOR · PLAN
BIOLOGICAL · LABORATORIES
QUIZ ROOM
GEN. BIOLOGY LAB
GEN. BIOLOGY LAB
BACTERIOLOGICAL LAB
ADVANCED BIO LAB
RESEARCH LAB
LIBRARY


THIRD · FLOOR · PLAN
DEPARTMENT · OF · CHEMISTRY
LECTURE HALL
PREP · ROOM
QUIZ ROOM
GEN. CHEMISTRY LAB
GEN. CHEMISTRY LAB
PHYSICAL CHEM
QUALITATIVE LAB
ORGANIC & FOOD LAB
QUANTITATIVE LAB
OFFICE

SECOND FLOOR

In the central position over the museum is the science reference library. On the opposite side of the corridor are toilet-rooms for teachers. Next the elevator, and served directly by it, is a large supply room for all departments in the building. With the exception of a large quiz room, the remainder of this floor is allotted entirely to biology. At one end are two large laboratories for general biology, and at the opposite end two similar but smaller laboratories for the advanced course and for bacteriology. There is also a small laboratory for research work. In addition to this there are two offices for the professors in biology and an aquarium room.

THIRD FLOOR

On the third floor is a lecture hall with 176 seats, for chemistry, with a preparation room lighted by an overhead skylight. Convenient to the stairs is a large quiz room with 49 seats. The remainder of the floor is given over entirely to chemical laboratories with two office rooms.

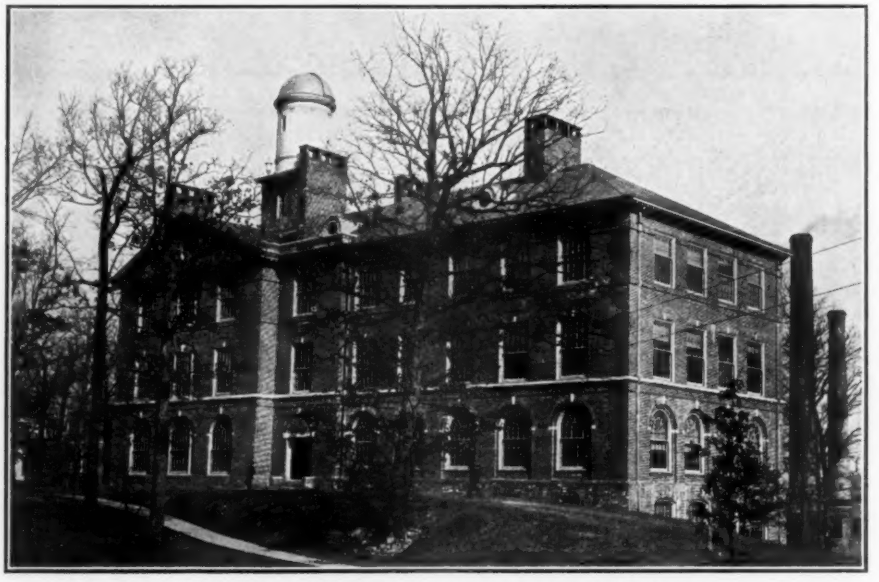
As the chemical laboratory is the most exacting as to equipment and utilities, particularly plumbing, it may be well at this point to call attention to the general system of handling the plumbing and other lines. Between the length of the typical end laboratories is a space about two feet wide, utilized chiefly for hoods, cases for equipment, etc., and also for ducts extending from the basement to the roof. This central position serves laboratories on two sides with the minimum of piping, and makes for both economy and flexibility.

ATTIC

Under new methods which are being developed for the teaching of astronomy, that science seems destined to play a conspicuous part in the future college curricula, as an exact science which is at the same time both inspirational and cultural. To house the four-inch telescope a small observatory has been designed in the form of a cupola, well above the tree-tops. Below the observatory is a deck designed for the use of sextants and other astronomical instruments. There is a large space in the attic under the pediment for class use. There is wall space for charts, maps, equipment, cabinets and transparencies; also floor space for tables and provision for quarters for three student janitors. It seems probable that this number will have to be increased by providing a similar apartment in the opposite end of the building. There is also a well-aired and well-lighted room which is available as an office for the astronomical department, and a similar room available for the animals (white rats, rabbits, etc.) used in the biological laboratories.

Heating and Ventilating

In connection with scholastic buildings there is today a strong movement by most authoritative experts, looking to the substitution of direct radiation and natural gravity ventilation for indirect heating and forced ventilation. In this building in front of the windows there are radiators with the temperature controlled by direct control valves, over which fresh outside air will pass into the rooms. This tends to form a plenum or pressure and, together with the heat applied to this air, tends to force it out of the ventilating registers located well up on the walls of the room. In case of the chemical fume hoods, there are fans at the roof end of the ducts. Fans are also used to accelerate draft in many rooms. The ventilating flues in the roof will be heated to accelerate the draft in certain rooms. This system offers a great saving in both first cost and maintenance, aside from being most practical and effective.



VIEW OF THE COMPLETED SCIENCE BUILDING OF BEREA COLLEGE, THE ARCHITECT'S DRAWING OF WHICH IS SHOWN ON PAGE 347

MATERIAL AND EQUIPMENT SPECIFIED OR USED

Insulation—Johns-Manville Corp.
Kalamine Doors—Moeschl Edwards Co.
Laboratory Equipment—E. H. Sheldon & Co. and Kewaunee Mfg. Co.
Plumbing—Standard Sanitary Mfg. Co.
Roofing—Rising & Nelson Slate Co.
Telescope Mountings—Warner & Swasey
Valves—Monash-Younker Co.
Ventilation—American Blower Co.—"Duriron" and "Alcumite"

The Science Laboratories of the Milwaukee University School

BY F. S. SPIGENER

DIRECTOR, AND

W. R. LEKER

HEAD OF THE SCIENCE DEPARTMENT

THE Milwaukee University school is located in the northeast part of the city in the vicinity of Downer College and the State Teachers' College. The new building was opened in the fall of 1927. The school consists of three units built in one building. The east unit is the Schneider Auditorium, which will seat about 700 people. It is a pretty hall with a well-equipped stage. The west unit is the gymnasium with its splendid equipment above the 80 x 60-foot floor. In the ground floor is a standard swimming pool with dressing- and locker-rooms adjoining.

The school unit is between the auditorium and the gymnasium. It is 254 feet long and two stories high, with the exception of the center portion, which houses the Science Department on the third floor. The school is planned to accommodate 500 students. Most schools crowd three or four times as many pupils in the same space.

The school offers work from the kindergarten through the senior high school. The science laboratories are used by the junior and senior high schools. General science is offered in the ninth grade, biology in the tenth, chemistry in the eleventh, and physics in the twelfth. One year of science is required of all pupils in the Senior High School.

The Science Department consists of two large combination lecture and laboratory rooms with many smaller rooms. The physics-chemistry laboratory occupies the north side of the building, and the biology-general science laboratory occupies the south side.

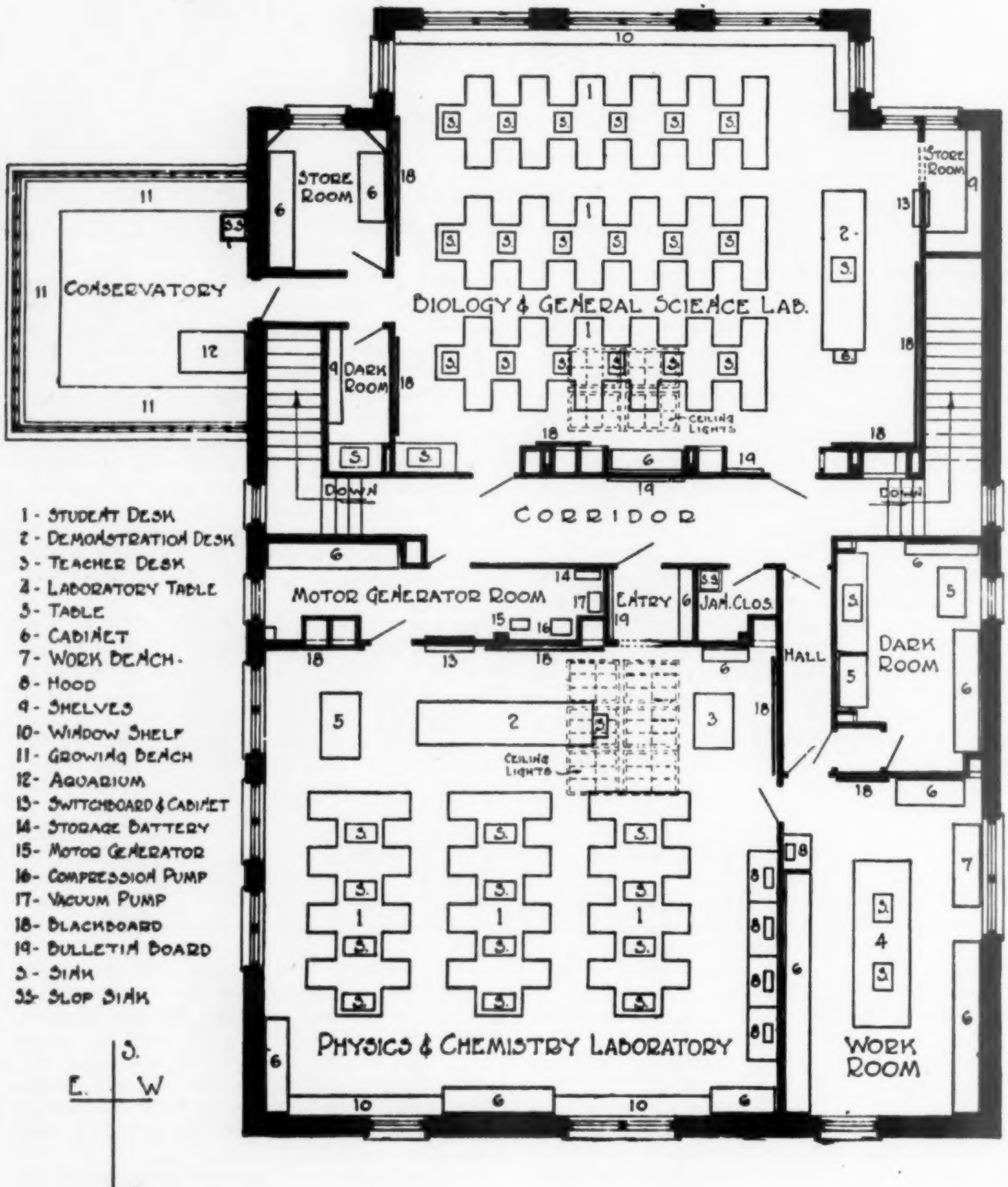
Physics-Chemistry Laboratory (34 x 37 feet)

This laboratory is equipped with a special type of desks, and an old demonstration table that took first prize at the World's Fair at St. Louis. The space between demonstration table and wall is 4 feet, between demonstration desk and student desk is 4 feet, between student desk and hood is 43 inches, between student desk and window shelf in the back of room is 64 inches, and between the student desks is 32 inches.

The demonstration table, although worn with use and old, was so well equipped that it was transferred to the new building. It is about 13 feet long, 3 feet wide, and 39 inches high. It has a large cupboard in each end. On either side of these cupboards are four large drawers. This arrangement leaves the middle of the table open for leg room when one sits behind the table. An electric heater is located under the top of one end of the desk, which can be used by removing a lid that fits flush with the desk top. In the center of the desk is a disappearing pneumatic trough that can be lifted above the top of the desk by a worm-gear arrangement. Besides having several plug electrical outlets, the desk has copper plates running the full length of the desk so that instruments can be connected anywhere with pegs. At the end of the desk is a large porcelain sink. The desk is equipped with hot and cold water, fume vent, gas, compressed air, vacuum, and electricity.

The student desks are of the Lincoln type, but revised to make them more serviceable. The arrangement of this form of room should be noted, as no pupil is more than 20 feet from the demonstration table. Instead of the narrow center portion of the desk, these were constructed 37 inches wide, so that each student has a center portion of the desk 13 inches on his side of the 12 x 16-inch ceramic sink. This also gives more space in the cupboards, and recesses for reagent bottles, and especially gives 14 inches length to the drawers in the center portion of the desk which will accommodate glassware. The wings of the desk are 26 inches long and 22 inches wide. These desks are equipped with hot and cold water in separate faucets, gas, and electricity. Two electric circuits run from the switchboard to each group of eight student desks. Regular chairs go with these desks, with seats 19¾ inches high. This height allows enough room for the thigh under the rail of the wing but still brings the student up so that he can work well. The wings have two drawers 15 x 10 inches and 4 inches deep. The desks are 33 inches high.

The hoods were also especially constructed for the room. The group consists of four compartments, 44 x 26 inches. The fume fan is in the attic and is run by a motor using the 220 3-phase power current. Fumes can be extracted from the top or bottom by means of a damper control. The fan that extracts the fumes from these hoods also extracts the fumes from the hood in the workroom and the demonstration table. A damper allows the full force of the fan to draw from the demonstration table. The hoods have a stone sink 8 x 12 inches and 7 inches deep, hot and cold water emptying into a single faucet, gas,



THIRD FLOOR PLAN
MILWAUKEE UNIVERSITY SCHOOL
VAN RYN & DE GELLEKE ARCHITECTS
MILWAUKEE WIS.

PHYSICS AND CHEMISTRY LABORATORY, MILWAUKEE UNIVERSITY SCHOOL

compressed air and electricity. Under each compartment are two large drawers, and under them a very large cupboard.

In the back of the room is a window shelf running the full length of the room from the cabinet in one corner to the cabinet in the other corner. It is 18 inches wide and runs under the reagent and material shelves. In the center of the north wall are the reagent shelves, and near the east end are the material shelves. In the northeast corner of the room is the material storage cabinet with drawers in the bottom for test tubes and other chemical ware. In the northwest corner of the room is another storage cabinet for materials, and especially those of large volumes, such as the common acids.

In the southwest corner of the room is a small cabinet for storing small instruments and apparatus used chiefly in physics. A skylight is above this portion of the room, so that all parts of the room are well lighted.

Electric Switchboard

Just back of the demonstration table toward the east is the electric switchboard, especially constructed for the department. It measures 60 x 42 inches and is made of ebony one inch thick. The cabinet on the back opens full width with two large doors into the motor-generator room so that the physics class may study all the connections. The sources are the 220 3-phase A.C. power circuit which was brought to the room for running the motor-generator, the 110 A.C., which is tapped off of the house lighting circuit, the 110 D.C., which is made by the motor-generator, and any voltage that one may want from the storage batteries. The resistance connected to the board is mounted overhead in the motor-generator room, making it accessible for study. Weston meters are used on the boards. The outlets from the board are fused with plug fuses and can be changed in a moment, as the whole back of the board is exposed when the cabinet doors are open. Four students are put on the same circuit. Any current can be supplied to that circuit with connecting cords by plugging them in the outlet socket and then to whatever source is wanted. If the amperage is wanted, then the current is put through the ammeter. The double terminals on the outlets are to accommodate the voltage readings.

A study table 6 x 4 feet, with reference books, is located in the southwest corner of the room.

The room is equipped with darkening shades and a large screen.

Motor-Generator Room
(24 feet x about 6 feet)

The motor-generator room really houses the switchboard, the battery of wet cells, motor-generator, vacuum pump, compression pump, and a two-compartment cabinet for storing electrical instruments. The vacuum pump is connected with the demonstration desks and is started and stopped by a switch on the desks. The compression pump supplies air to the demonstration tables, the workbench in the workroom, and the hoods.

Workroom
(24 feet x 14½ feet)

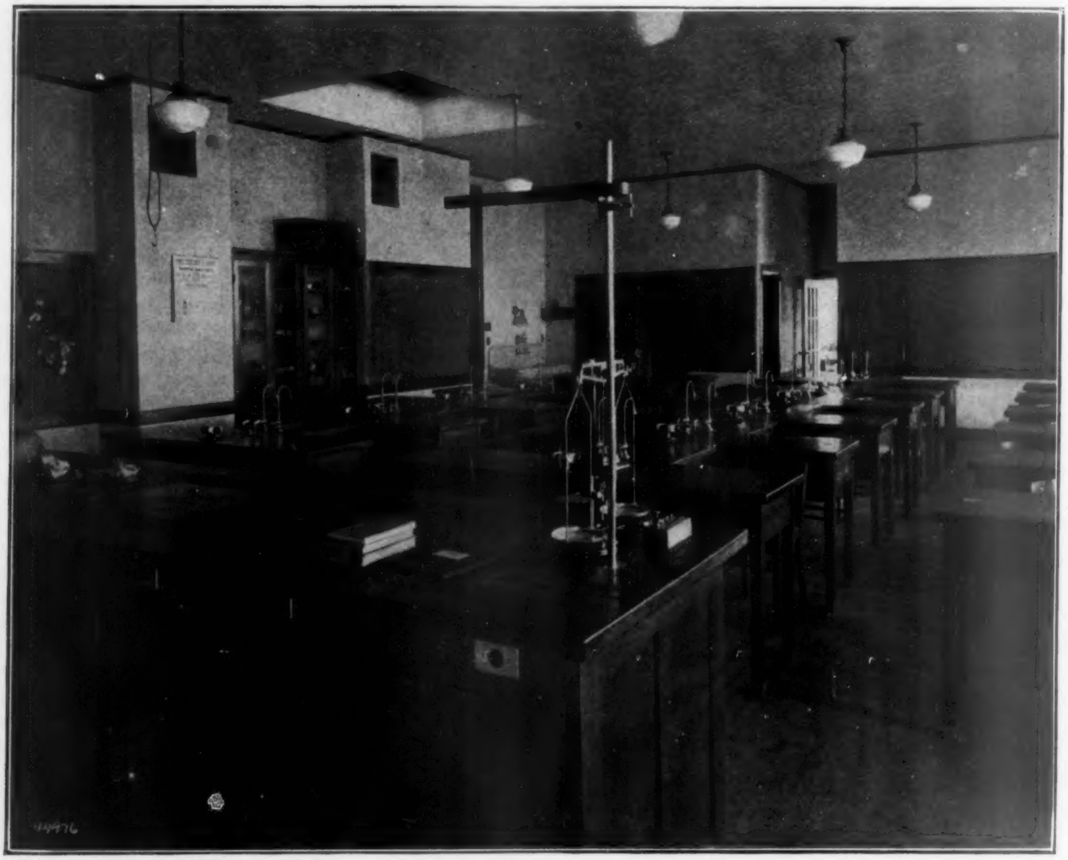
This room is equipped with a regular 16-student laboratory desk which will accommodate 8 students at a time. Should there be an overflow in the regular laboratory, then this desk may be used, but that was not really the object for putting in the desk. It is chiefly for students who wish to do special things in a place away from the regular classes. This desk is supplied with hot and cold water, gas and electricity. A large cabinet 17 feet long and 18 inches deep on the east wall, and a cabinet 13 feet long and 22 inches deep along the west wall provide storage for most of the science apparatus. One has drawers below, and the other has cupboards. One has hinged glass doors, and the other has sliding glass doors. A small hood in this room is connected with the others through the wall. It has a small drain, and the other hood equipment. A workbench 6 x 2 feet, with gas and compressed air, is placed in front of the west window.

Dark-Room
(10 feet 3 inches x 17 feet 3 inches)

This room has a large alberine stone sink 20 x 30 inches with two drain boards. Two movable tables are in this room and can be shifted into any location as photographic and other work demands. Two storage cabinets are put in this room, one for storing biological materials, and the other for trinkets and parts that are always necessary in any experimental laboratory.

Biology-General Science Laboratory
(38 x 32 feet)

The biology-general science laboratory is larger than the physics-chemistry laboratory, but by



BIOLOGY AND GENERAL SCIENCE LABORATORY IN THE MILWAUKEE UNIVERSITY SCHOOL

putting 36 student desks in the room, it does not give the space for free movement that is had in the physics-chemistry laboratory. The nature of the work does not demand much movement, consequently the space has been adequate. The space between demonstration table and wall is 4 feet, between demonstration table and student desk is 4 feet, between student desk and back wall is 35 inches, and between student desks is 2 feet.

The demonstration table is 12 feet long, 3 feet wide, and 39 inches high. It has a stone sink 20 x 12 inches and 12 inches deep at one end, and a ceramic sink 20 x 20 inches and 8 inches deep in the center of the table. This center sink has disappearing faucets and a cover that fits flush with the table top. Large cupboards are in each end of the table, then four large drawers on each side, and then open space in the center for leg room when sitting back of the table. This desk is equipped with three electric circuits, hot and cold water at each sink, gas, compressed air, and vacuum.

The student desks are the regular Lincoln type general science desks. The chairs are like those in the physics-chemistry laboratory, 19¾ inches high. The desks are equipped with hot and cold water, gas and electricity. Six students are put on the same circuit in this room instead of four as in the physics-chemistry room.

A cabinet with glass doors was built between the vents of the north wall. The lower part of the cabinet is fitted with 12 large drawers. Microscopes and other biological apparatus and material are stored in this cabinet.

The electric switchboard back of the demonstration desk is the same as the one in the physics-chemistry room and gets its current from the same source. The outlets are slightly different, to accommodate the different arrangement.

The small storeroom at the west end of the laboratory, back of the switchboard, has open shelves for storing specimens from day to day as the students are working on dissections and collections.

Storeroom
(9 feet x 9 feet 6 inches)

The storeroom has two cabinets. One is for storing books, circulars and catalogs; the other is for storing specimens and supplies. They have glass swinging doors with cupboards below.

Dark-Room
(11 feet x 4 feet 6 inches)

The dark-room has a stone sink 20 x 30 inches with one drain board. The shelves along the side are open. This room is used chiefly in connection with the conservatory.

Conservatory
(18 x 17 feet)

The conservatory is built out on the roof of the second story. It has a growing-bench along three sides of the room. The entire top is glass with vents at the bottom and top. During the first winter in the building, much trouble was experienced in keeping the temperature uniform. In the daytime, steam heat, with the sun, often ran the temperature very high despite what might be done to prevent it. In the absence of steam at night an oil stove was lighted to keep the room warm. It appears that a hot-water heating system for the conservatory alone is the only solution for keeping uniform heat. The fuel may be gas or oil regulated by thermostatic control. The heater of course must be housed outside the conservatory. A large aquarium is installed near the door in the conservatory.

Features

Every room in the department is well supplied with wall and floor electrical outlets.

By combining the old type lecture room and laboratory into one room, the cost of equipping the science department has been greatly reduced. It makes a more practical workshop, every day being a lecture and laboratory day without shifting a student.

PRINT SHOP OF THE ASHEVILLE SENIOR HIGH SCHOOL, ASHEVILLE, N. C.
(See article descriptive of this new school on pages 75 to 80)

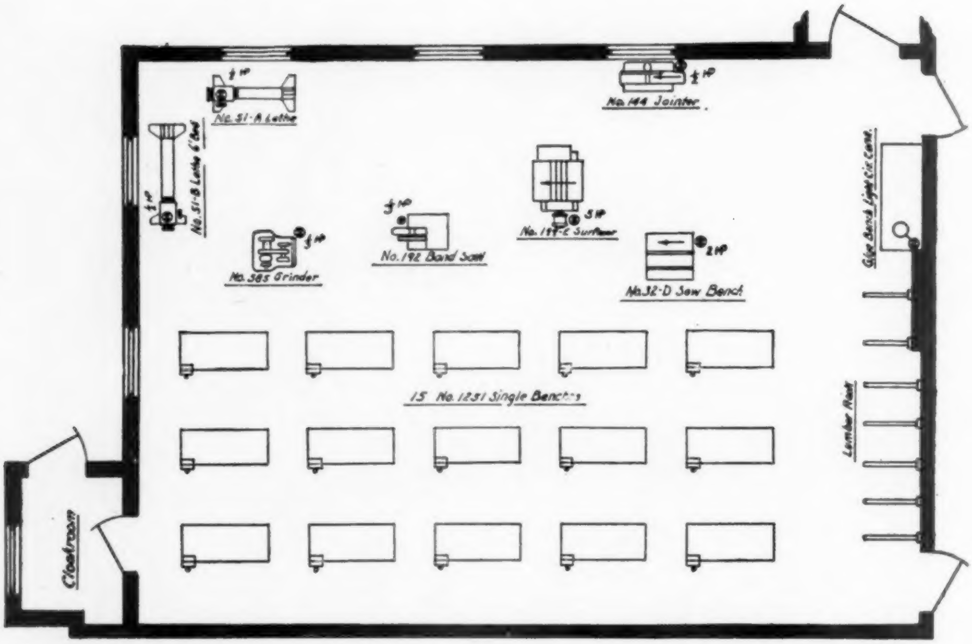
Photograph by courtesy of Carter Blozonend Flooring Co.
AUTO-WOODWORKING SHOP IN THE ASHEVILLE JUNIOR HIGH SCHOOL

MANUAL ARTS DEPARTMENT OF THE NICHOLS INTERMEDIATE SCHOOL, EVANSTON, ILL.

(See article descriptive of the Home Economics Department of this school on pages 328 to 334)

Illustrations by courtesy of Childs & Smith, Architects

METAL WORK SHOP OF THE NICHOLS INTERMEDIATE SCHOOL



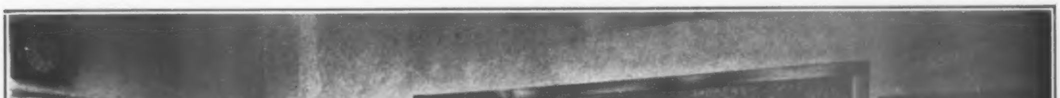
MANUAL TRAINING DEPARTMENT LEETONIA PUBLIC SCHOOLS, LEETONIA, OHIO

Drawings by courtesy of Oliver Machinery Company

MANUAL TRAINING LAYOUT, DUMONT HIGH SCHOOL, DUMONT, N. J.

Photograph by courtesy of Barnhart Brothers & Spindler

PRINTING DEPARTMENT, McKINLEY TECHNICAL HIGH SCHOOL, WASHINGTON, D. C.



Photograph by courtesy of J. A. Fay & Egan Co.

WOODWORKING SHOP OF THE WEST JUNIOR HIGH SCHOOL, DULUTH, MINN.

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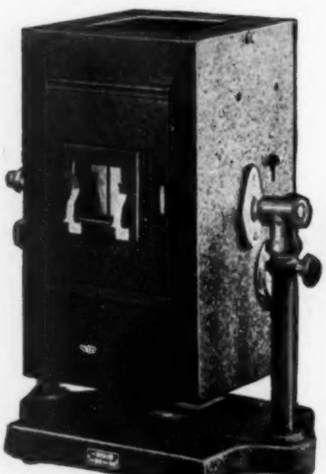
Chicago, Ill., 30 No. Michigan Ave. — San Francisco, Calif., 220 Phelan Bldg.

ULTRA VIOLET LIGHT APPARATUS FOR THE SCIENTIFIC LABORATORY OF THE SCHOOL AND UNIVERSITY

HANOVIA, the pioneer in the Ultra Violet Lamp manufacturing field, now places at the disposal of laboratory workers a varied type of Ultra Violet producing apparatus for practical laboratory usage—so constructed to meet every conceivable use for which ultra violet light is required.

A newly designed lamp unit is here brought to the attention of chemists, physicists and others. It is known as the new ADVANCED RESEARCH MODEL LAMP. It offers a very high intensity arc, operative horizontally or vertically, with the utmost convenience and adaptability for certain purposes. This new equipment and many other new and interesting items are described and illustrated in detail in the new—

HANOVIA BULLETIN NO. 20



THE NEW HANOVIA ADVANCED RESEARCH MODEL LAMP

Through extensive investigations which scientists have made, a comprehensive understanding of the production, behavior and economics of light is being reached. Most of these developments have been centered about the invisible ultra violet rays. These rays have the capacity for producing chemical and biological reactions and seemingly, the possibilities of experimentation with them is unlimited.

Important applications of Ultra Violet Rays as produced by the quartz mercury vapor arc lamp are being made at the present time in photochemistry, spectrometry, polarimetry, interferometry, photomicroscopy and in photoelectric and absorption studies.

They are also used in the testing of paints, textiles, paper, rubber, etc.

Chemists, physicists, biologists, zoologists, physiologists, botanists, etc., should investigate this potent scientific agent, and should have a copy of the new—

HANOVIA BULLETIN NO. 20

which will be sent upon request.

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Hanovia was the first in the production of electric laboratory furnaces, and through long experience has earned the confidence of laboratory workers who are insistent upon obtaining equipment which is of sound design and construction—and efficient and economical in operation. The HANOVIA Laboratory Furnace is of the tubular type, and it employs a platinum wound heating element. It is particularly noted for its long, economical life. Made in several sizes, ranging from $1\frac{3}{16}''$ bore to $2\frac{1}{2}''$—and from 9″ to 24″ long. The temperature ranges between 1300° C. in the larger types—to 1400° in the smaller types. **Nominally priced.**

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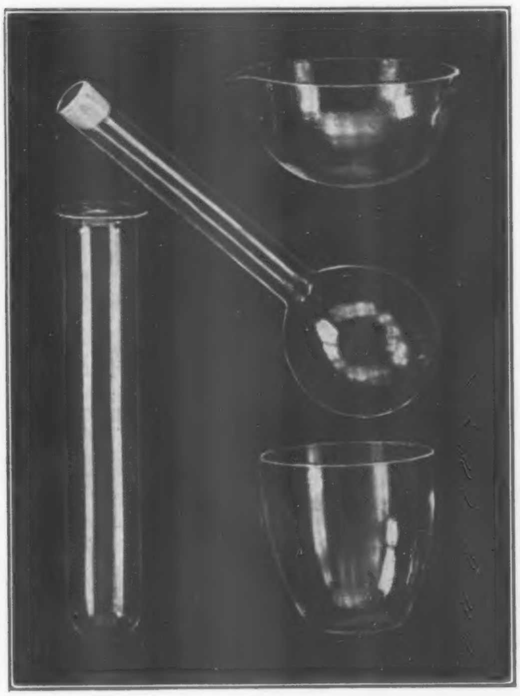
San Francisco, Calif., 220 Phelan Bldg.

TRANSPARENT QUARTZ LABORATORY WARE FOR APPLICATION IN THE RESEARCH OR TEACHING PROGRAM

With the now increased knowledge of quartz glass, quartz ware enjoys wide usage in the laboratory of the school and university. It is most interesting and unique, and should have the attention of those not yet acquainted with its properties and application. Its extreme fusion point (about 1700° C.) and its highly refractory nature (nearly inert thermally under 1300° C.) assures apparatus which remains neutral during the course of experimentation. It is non-hygroscopic and is insoluble in water and most acids. It has a light transmission down to the extreme limit of permeability at 1850 A. U. At ordinary temperature the specific gravity is 2.22.



HANOVIA Quartz Ware is produced in a wide variety of standard pieces of both crystal and fused quartz. We also specialize in the production of apparatus made in accordance with specifications. In HANOVIA quartz apparatus an exceedingly high standard of workmanship is always found, and only the purest rock crystal is employed in its manufacture.

SPECIAL INTRODUCTORY OFFER

We are making an attractive trial offer to laboratory workers in schools and universities who have not employed quartz ware. By taking advantage of this offer it will give the new user an opportunity to learn how valuable this quartz ware is in his work. The following items comprise the offer. The price as indicated is a special one, and only effective in this introductory offer.

Items Comprising Introductory Offer

- 1 transparent fused quartz test tube 100 mm. x 10 mm.
- 1 transparent fused quartz plain flask 25 cc. capacity
- 1 transparent fused quartz evaporating dish 25 cc. capacity
- 1 transparent fused quartz crucible (platinum shape and without cover) 25 cc. capacity

Price for four (4) items delivered—$8.00

HANOVIA BULLETIN NO. 20

Gives a description of the Hanovia Laboratory products which should be in the laboratory of every school and university. A copy will be forwarded on request.

KEWAUNEE MANUFACTURING COMPANY

LABORATORY FURNITURE EXPERTS

178 LINCOLN STREET, KEWAUNEE, WIS.

Chicago Office: 14 East Jackson Boulevard	C. G. CAMPBELL Pres. and Gen. Manager	New York Office: 70 Fifth Avenue

OFFICES IN PRINCIPAL CITIES

Kewaunee

LABORATORY FURNITURE FOR SCHOOLS AND COLLEGES

Kewaunee is used in the better schools throughout America for the teaching of Physics, Chemistry, Biology, Electricity, Drawing and Art, Domestic Science, and Manual Training.

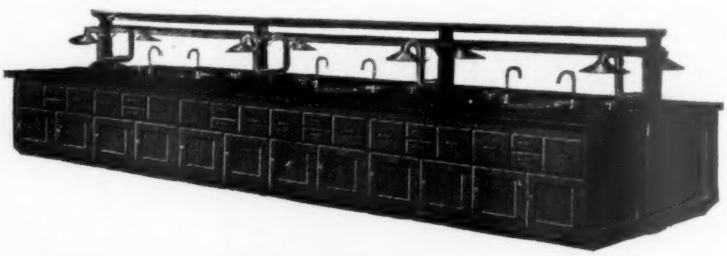
Kewaunee is most scientifically designed for the greatest possible pedagogic service.

Kewaunee is made by men who know woods—how to select, how to treat before use, and how to fashion for long life and perfect service.

Kewaunee is moderately priced—it is the greatest value in its field.

Kewaunee does stand up under service. It is constructed "extra heavy"—heavier than necessary—affording that reserve of solidity that insures extra years of service under rigorous conditions.

CHEMICAL DESK NO. 856



LABORATORY OF THE COLLEGE FOR WOMEN, NEW JERSEY UNIVERSITY, NEW BRUNSWICK, NEW JERSEY

CHEMICAL LABORATORY DESK AND HOOD NO. 15025

LET KEWAUNEE HELP

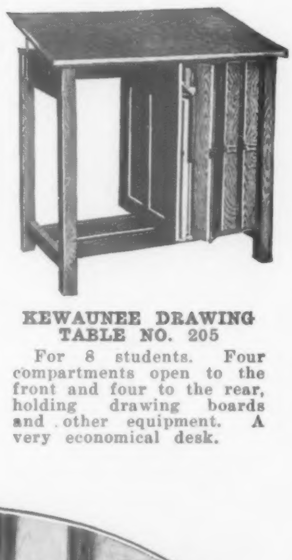
you decide what is most practical and economical for your institution. We are at your service. Address all inquiries to the factory at Kewaunee.

NO. 16035—DOMESTIC SCIENCE TABLE WITH SWINGING CHAIRS

This table accommodates four students at one time. Also furnished with swinging stools instead of chairs. Kemco Process Monel Metal Top.

NO. 734 — KEWAUNEE CASE FOR APPARATUS AND SUPPLIES

Upper section 16½ in. deep x 55 in. high inside. Lower section 24 in. deep x 36 in. high outside. Made in 4 ft., 5 ft., 8 ft. and 10 ft. lengths. Solid selected oak, finely finished. Doors slide freely on ball bearings. Overlap dustproof fronts. 6 drawers and 2 cupboards.



KEWAUNEE DRAWING TABLE NO. 205

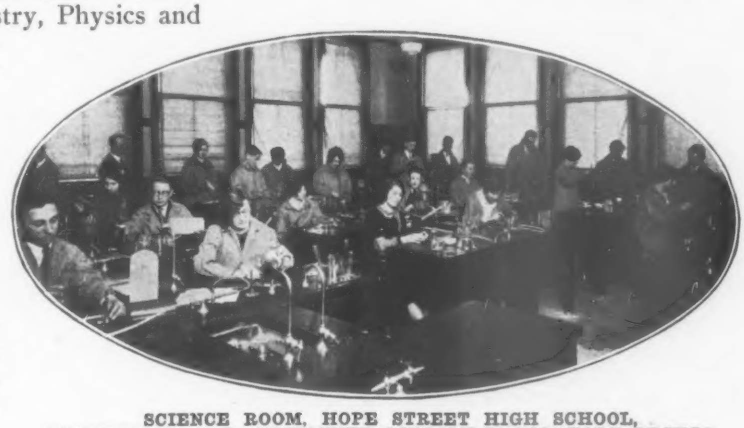
For 8 students. Four compartments open to the front and four to the rear, holding drawing boards and other equipment. A very economical desk.

ONE BUYER WROTE

"Ten years ago we purchased Kewaunee Furniture for our Chemistry, Physics and Domestic Science Laboratories. It is still in very good condition."

SEND US YOUR FLOOR PLAN BLUEPRINTS OR ROUGH SKETCHES

We will make suggestive layout for equipment to meet your requirements without charge or obligation.



SCIENCE ROOM, HOPE STREET HIGH SCHOOL, PROVIDENCE, R. I., KEWAUNEE LINCOLN LABORATORY DESKS

THE MATHESON CO.

NORTH BERGEN, NEW JERSEY

Gas Department

THE LECTURE BOTTLE

For Universities, Colleges, High Schools and Individuals

Interchangeable in twenty-four gases—shipped on day order received.

On account of its convenience it has become Standard Laboratory equipment. It does not need a regulator—its valve being delicate enough to permit close adjustment without one. Ask for Bulletin III.

LABORATORY GASES

We can supply 24 different gases for Laboratory use in five sizes of containers.

Ask for Bulletin II.

LABORATORY AUTOMATIC REDUCING REGULATORS

Needle Valve Outlet and Hose Connection, also supplied with single gauge.

For Oxygen, Hydrogen, Nitrogen, Carbon Dioxide, Argon, Helium, Nitrous Oxide and other gases. Close register on low working pressures.

Ask for Bulletin IV.

Apparatus Department

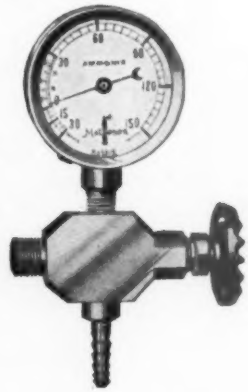
GASOMETER EQUIPMENT FOR LIQUID HYDROGEN SULFIDE SUPPLY

For classroom use ask for Bulletin I.

For individual use see Bulletins II and III.

GASOMETERS are now the accepted form of sulfuretted Hydrogen supply. Available in 5 sizes of cylinders.

AMMONIA REGULATOR (Non-Automatic)



Permits quick and easy adjustment of flow to less than one bubble per second up to full flow.

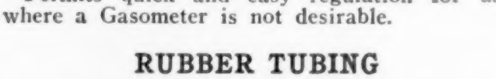
Ask for Bulletin IV.

NON-AUTOMATIC NEEDLE VALVE

For use with all kinds of gases.

Permits quick and easy regulation for use where a Gasometer is not desirable.

RUBBER TUBING



We carry in stock large supply of rubber tubing in six sizes, 2 weights and three colors. This tubing is specially prepared for use with laboratory gases.

THE MATHESON CO.

NORTH BERGEN, NEW JERSEY

SHOWING PART OF APPARATUS IN USE

MICRO-ANALYSIS

Testing Equipments including Special Apparatus and Prepared Reagents with full instructions for use. The illustration below shows compact pocket-size kit.

THE ALCOHOLOMETER

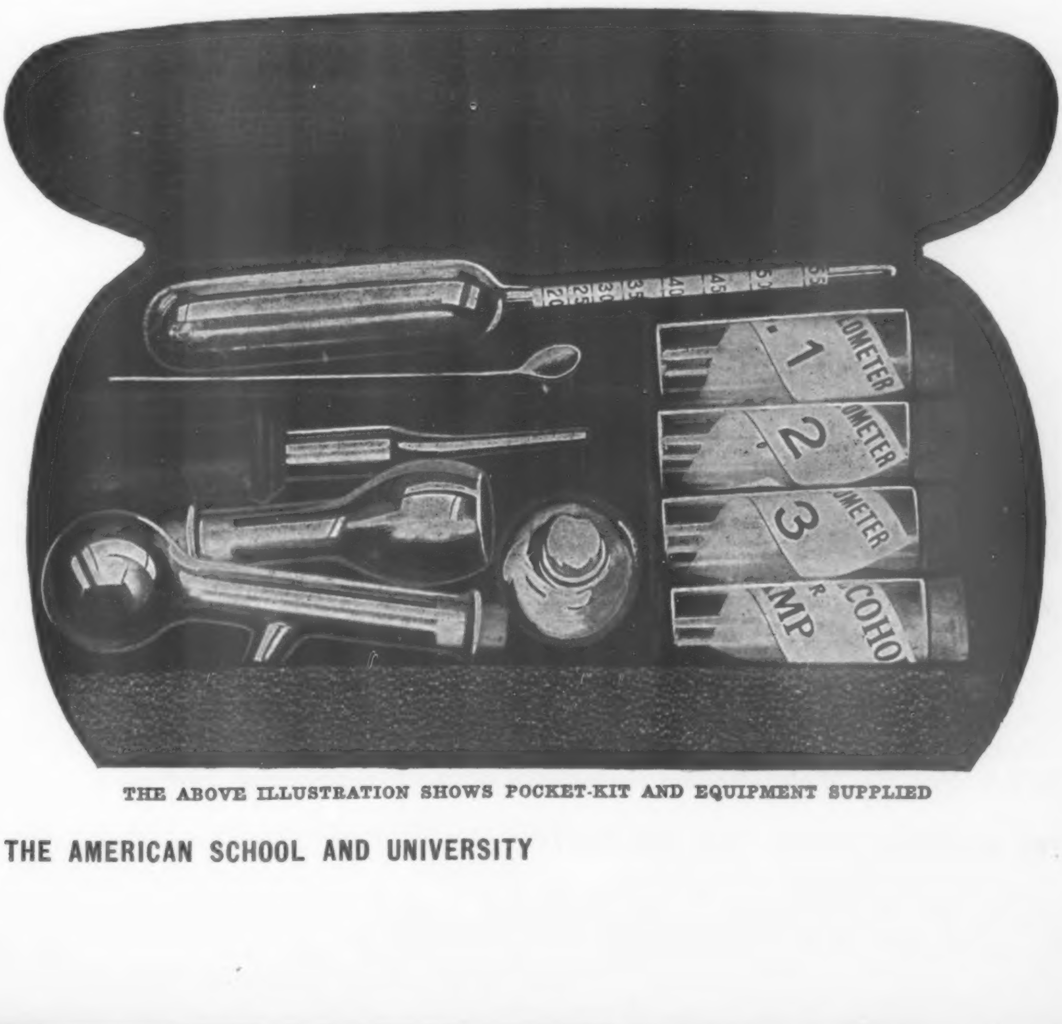
For detecting Wood Alcohol and determining, in any solution, the percentage of ALCOHOL.

THE URINOMETER

For detecting Albumen — Acid — Bile — Sugar and determining Specific Gravity of URINE.

THE LACTOMETER

For determining Specific Gravity and Temperature of MILK.



THE ABOVE ILLUSTRATION SHOWS POCKET-KIT AND EQUIPMENT SUPPLIED

NO. 4120

SHELDON DOMESTIC SCIENCE TABLE NO. 4120

This table is the culmination of a development involving years of experience with scores of designs in thousands of schools.

It is unsurpassed in convenience of arrangement, capacity of working surface and storage space; ease in cleaning and keeping clean and finally, strength and durability.

The same qualities of convenience, capacity and sturdiness are applicable to the entire line of more than 35 designs of tables and fixtures for Domestic Science and Domestic Art Departments.

Sheldon Complete Line illustrated in Catalog No. 22. Mailed free on request.

NO. 6380

SHELDON DRAWING TABLE NO. 7241

The Sheldon catalog shows over 20 designs of Art and Mechanical Drawing Tables with a range of capacity from one to eight classes. They are built of material 20% heavier than offered by other manufacturers and every principal frame joint is re-enforced with a bolt and nut.

NO. 7241

SHELDON MANUAL TRAINING BENCH NO. 6380

One of the most efficient all around units for the school shop. It is made of heavy selected maple; bolt re-enforced throughout and equipped with a guaranteed Sheldon vise; one of eight designs and sizes.

The Sheldon Catalog illustrates

35 types of Domestic and Sewing tables
20 " " Art and Mechanical Drawing tables
50 " " Manual Training Benches
27 " " Cases and Cabinets
6 " " Commercial tables
28 " " Auxiliary Furniture

ALBERENE STONE COMPANY

Quarriers and Fabricators of Alberene Stone

Main Office: 153 West 23rd Street, NEW YORK

Quarries and Mills at Schuyler, Va.

BRANCHES

Boston	Philadelphia	Pittsburgh	Chicago
Newark, N. J.	Richmond, Va.	Cleveland	Washington, D. C.

PRODUCTS (See also page 116)

Alberene Stone, a natural quarried stone, fabricated for the following laboratory purposes:

- Table Tops and Backs
- Reagent Shelving
- Fume Hoods
- Sinks and Drainboards
- Baths and Tanks
- Acid and Chemical Storage
- Acid-proof Flooring and Base
- Pegboards
- Gutters

PHYSICAL AND CHEMICAL PROPERTIES

Alberene is a natural quarried stone, blue-gray in color, dense and non-stratified, chemically inert, impervious and non-staining, highly resistant to acid, alkali, flame and fire, non-absorbent and easily cleanable. It is easily machined—tongued, grooved, bored, drilled, slotted or turned—without splitting or spalling.

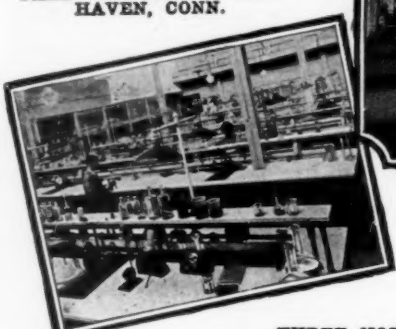
METHOD OF CONSTRUCTION

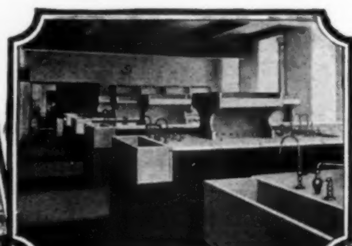
Alberene Stone laboratory fixtures are built by methods possible with no other stone. They are practically one-piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corroding metal cemented in grooves, with abutting edges of the slab ground and sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented. Such joints are permanently gas-and-liquid-tight.

SERVICE IN DESIGN AND INSTALLATION

Every laboratory of major importance equipped in the past 20 years has used Alberene Stone wholly or in large part. Out of this large experience the Company offers an advisory service, freely available to school and university authorities and architects.

STERLING CHEMISTRY LABORATORY YALE UNIVERSITY, NEW HAVEN, CONN.





UNIVERSITY OF WEST VIRGINIA, MORGANTOWN, W. VA.

BAKER CHEMISTRY LABORATORY CORNELL UNIVERSITY, ITHACA, N. Y.

THREE NOTABLE EDUCATIONAL LABORATORIES EQUIPPED THROUGHOUT WITH ALBERENE STONE

BAKER & CO., INC.

R & H PLATINUM WORKS, INC.

54 Austin Street, NEWARK, N. J.

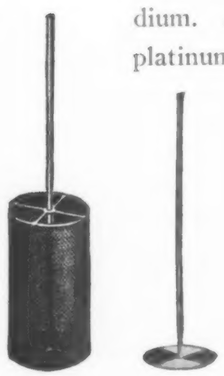
30 Church St. NEW YORK | 760 Market St. SAN FRANCISCO | 5 So. Wabash Ave. CHICAGO

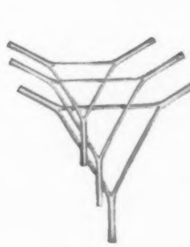
PLATINUM WARE FOR ALL LABORATORY AND INDUSTRIAL PURPOSES

BAKER & CO., INC.

announce the purchase of the good will, machinery and metal stocks of the R & H Platinum Works, Inc., of New York City and Perth Amboy, N. J., and that they are conducting this business as a department of their organization. Mr. F. A. Croselmire will continue in charge of all matters pertaining to R & H patrons.

One Chief Baker specialty is laboratory ware made from platinum-rhodium. As compared with pure platinum, platinum-rhodium has many very dsitinct advantages. The alloy is stiffer than platinum and vessels made of it keep their shape better. It becomes less soft on heating and does not tear so easily. On ignition, its weight constancy is better. It is harder and so suffers less loss from sand cleaning. Fusion and acid losses are smaller and fusions do not distort crucibles made of it. The melting point is slightly higher. Crystal development is slower and the crystals are smaller. The rate of vaporization is less.





The Baker line includes everything the well equipped laboratory needs in platinum ware, either made of the pure metal or of the platinum-rhodium just described. Another specialty is platinum gauze for ammonia oxidation in the manufacture of nitric and sulphuric acids. Platinum, both pure and alloyed is available in all forms as well as platinum black, sponge, salts and solutions.

Baker & Co., Inc., are headquarters for wires for thermocouples, bare drawn wires of ductile materials down to 0.0008″ and others, from very ductile metals, as small as 0.0005″. There is a long series of Wollaston wires and wires made by the Taylor Process from such elements as antimony, bismuth, cadmium, cobalt, gallium, lead, selenium, etc.

Prices are the lowest possible to quote for products of the highest quality. The Baker guarantee stands behind everything produced.

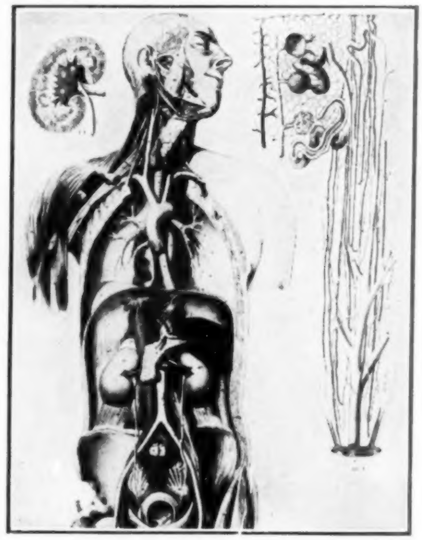
CLAY-ADAMS COMPANY

Importers of Skeletons, Models and Charts

117–9 East 24th Street, NEW YORK, N. Y.

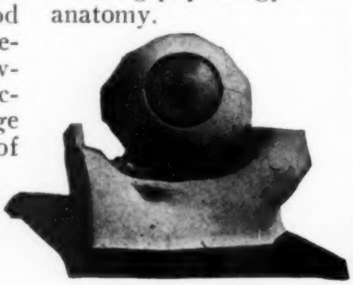
SKELETONS

We carry a large stock of skulls and skeletons and bone preparations. The illustration shows a choice first quality articulated human adult skeleton with olive colored steel cabinet, with novel arrangement by which the suspended skeleton may be pulled outside of the cabinet and turned around for demonstration. With lock and key. Cabinet crated separately, knocked down.



SPALTEHOLZ PREPARATIONS

The illustration shows a 5 months' human embryo, put up in a museum jar under the direction of Prof. Spalteholz, using his method by which the tissue becomes transparent showing the skeletal structure. We have a large collection of these of all stages, and also organs and parts of the body, some with veins and arteries injected. All in natural coloring, true to nature in detail and execution. Inexpensive, but valuable aids in teaching physiology and anatomy.



CHARTS

We carry a large stock of human anatomy charts, each with keys giving complete English and Latin nomenclature. We have charts of the skeleton, the muscular system, internal organs, organs of sense, etc, etc.

ANATOMICAL MODELS

Our catalog, which will be sent on request, illustrates and describes a large variety of anatomical models; complete life size bodies, trunk only, separate organs in natural size and enlarged as much as ten times. The illustrations show two models which are separable into numerous parts, showing all ramifications.

CORNING GLASS WORKS

World's Largest Makers of Technical Glassware

DEPT. 79, Industrial and Laboratory Division, CORNING, N. Y.

New York Office: 501 FIFTH AVE.

CGW PYREX
T. M. REG. U. S. PAT. OFF.
LABORATORY WARE
A Product of Corning Glass Works

Pyrex Glassware is the choice of experienced chemists and laboratories throughout the world, because it is readily obtainable in any supply house, in all desirable forms for laboratory work, and because it possesses a strength, ruggedness and durability that cannot exist in ware of ordinary composition. It is the only laboratory ware that fully meets the requirements of daily usage and exacting chemical processes.

An extremely low expansion coefficient provides resistance to damage from excessive heat and sudden temperature changes.

High chemical stability almost completely avoids attack from ordinary reagents.

Heavy walls and substantial enduring strength afford added protection under constant rough and hurried handling.

When a valuable piece does break, mending is often possible, with the repair fully as dependable and useful as the original structure.

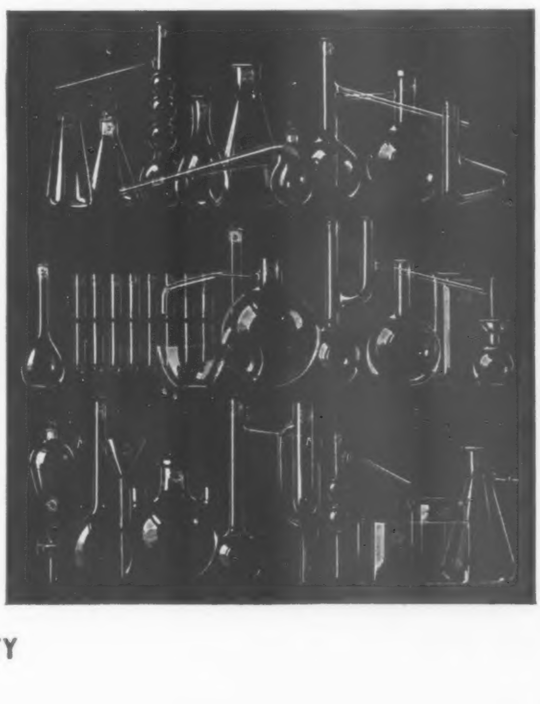
Heating with a burner and blast permits innumerable changes of contour, bending of tubes without breakage losses, and by heating to the fusing temperature, two pieces are easily welded together.

Standard forms include 40 types of flasks, twenty types of tubes and an unlimited variety of beakers, reagent bottles, crystallizing and evaporating dishes, graduates, plain cylinders, desiccators, funnels, seals, ground joints, stop cocks, etc., such as are used in ordinary work.

Many special pieces can be fabricated from standard forms right in the laboratory and complicated special equipment or pieces made to specification can be furnished from the factory for prompt delivery and at reasonable cost.

By equipping your laboratory throughout with PYREX Ware, you will minimize breakage losses and expense, you can get exactly what you need, and will have no trouble in obtaining hurried duplications.

Ask your nearest dealer for the PYREX Laboratory Glassware Price Catalog, or write direct to us.



T. M. REG. U. S. PAT. OFF. PYREX CORNING MADE IN U. S. A.

The Mark of Dependability

The trade-mark PYREX designates products of Corning Glass Works. It is synonymous with highest quality in materials and workmanship.

HOYT ELECTRICAL INSTRUMENT WORKS

775 Boylston Street Hoyt BOSTON, MASS.

For more than twenty-five years Hoyt has been building meters for every industry and for laboratory and school-room use. Hoyt instruments are well and favorably known for their dependability and ruggedness of construction which assures their long life in the hands of students.

515 VOLTAMMETER

PORTABLE VOLTAMMETERS

For Direct Current

Wherever direct current circuits have to be checked frequently, it is often an advantage to have both voltage and current measuring ranges on the same instrument. The Hoyt No. 515 Voltammeter offers six ranges in one meter. The movement is of the D'Arsonval type with a sensitivity of 70 ohms per volt, mounted on a Black finished base. Hardened steel pivots turn on sapphire bearings. The scale is hand drawn, length 3½", permitting accurate and close readings. Voltage scales are read by attaching leads to the proper binding posts. Current measurements are made by pressing the button switch after proper connections to the terminals have been made. Standard ranges are as follows:

Number	Volts	Amperes	Price
515	0-3 0-30 0-150	0-3 0-15 0-30	$30.00

Other combinations of ranges can be supplied. Prices on request.

ROTARY TYPE

Voltammeters of the Hoyt Rotary type have become popular in automobile service work, in radio, in railroad-signal and fire-alarm maintenance, and in fact, everywhere there is a demand for a compact rugged combination instrument of small size with a number of ranges. The design is exclusively Hoyt; and as nearly "accident proof" as it is possible to make a measuring instrument. The meter movement is in a nickeled case mounted on a suitable block, containing a Rotary switch, so arranged that as the meter itself is turned, the proper connection is made for reading its various scales. The meter has a D'Arsonval movement, sensitivity of 70 ohms per volt; with jeweled bearings; scale length: 1¾", accuracy: 1%.

RANGES

Number	Milli-amps	Am-peres	Milli-volts	Volts	Price
Style 1 .... (Rotary Type)	....	0-3 0-30	0-90 ...	0-3 0-30	$17.50

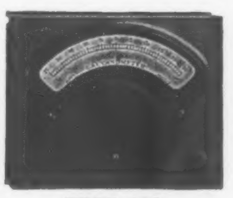
Other combinations of ranges can be supplied provided individual ranges are multiples of each other, so the scale can be easily read. Current scales can be as low as 15 M.A. and as high as 50 amps.; voltage scales between 90 M.V. and 300 volts. Prices will be furnished on request.

PORTABLE VOLTMETERS AND AMMETERS

NO. 515 FOR DIRECT CURRENT
NO. 517 FOR ALTERNATING CURRENT

Hoyt portable voltmeters and ammeters are mounted on **Bakelite** bases 5" x 4". The movements for direct current are of the D'Arsonval type equipped with drop forged magnets carefully hardened and drawn to insure permanence. All pivots turn in sapphire bearings. The scales are hand calibrated. The alternating current meters are built on the repulsion or soft-iron principle. Damping is secured by a vane attached to the movement moving in a partially closed air chamber. Accuracy—1%. Prices on type 515. Direct current Voltmeters and Ammeters range from $15.00 to $25.00; while on Type 517 alternating current meters the prices range from $18.00 to $27.50.

PORTABLE GALVANOMETERS



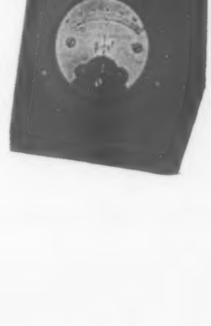
TYPE 515 GALVANOMETER

Type 515 Galvanometer has a low resistance D'Arsonval movement of quick response but dead beat. Generous size springs are used. A large drop-forged magnet carefully aged, supplies a dense magnetic field in which the movement turns on sapphire bearings. The mounting is a 5" x 4" **Bakelite** base. Total scale length is 3½ inches. The miniature galvanometer No. 510-M, is mounted in a 45 degree angle block for ease in reading from any position. The moving system has a somewhat higher resistance but is more sensitive. Magnet and movement are the same quality as the No. 515.

TYPE 515

Scale: 25-0-25 Millivolts
25-0-25 Milliamperes
Resistance: 1 ohm

Price: $15.00



TYPE 510-M

Scale: 30-0-30 Divisions
Sensitivity: 23 Microamperes will move the pointer one scale division.
Resistance: 30 ohms

Price: $12.50

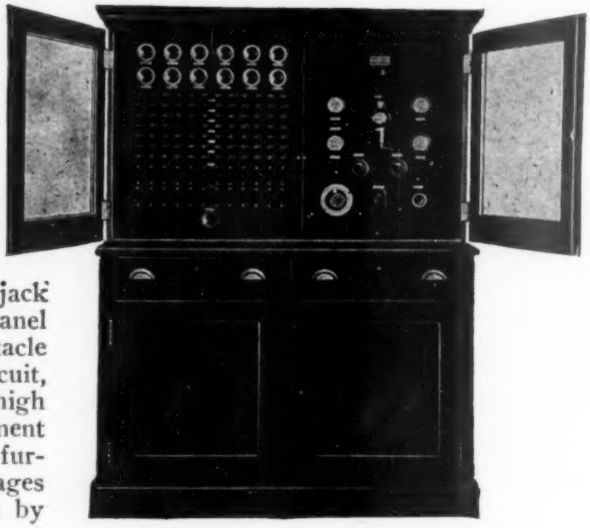
THE STANDARD ELECTRIC TIME COMPANY

SPRINGFIELD, MASS.

The Standard Electric Time Co. of Canada, Ltd., 726 St. Felix St., Montreal, P. Q.

ATLANTA, 204 Glenn Bldg.
BALTIMORE, 2 E. Redwood St.
BIRMINGHAM, 625 S. 18th St.
BOSTON, 10 High St.
BUFFALO, 901 Mutual Life Bldg.
CHARLOTTE, N. C., 217 Latta Arcade
CHICAGO, 1510 Monadnock Bldg.
CLEVELAND, 1333 Union Trust Bldg.
COLUMBUS, O., 83 South High St.
DALLAS, 716 Mercantile Bank Bldg.
DENVER, 562 Penn St.
DETROIT, 806 Donovan Bldg.
KANSAS CITY, MO., Mutual Bldg.
LOS ANGELES, Room 670, 124 W. 4th St.
MINNEAPOLIS, 745 McKnight Bldg.
NEW YORK CITY, 50 Church St.
PHILADELPHIA, 1612 Market St.
PITTSBURGH, Bessemer Bldg.
PORTLAND, ORE., 65 First St.
SAN FRANCISCO, 1 Drumm St.
SCRANTON, 148 Adams Ave.
SEATTLE, 918 Western Ave.
SPOKANE, 110 S. Cedar St.

STANDARD LABORATORY EQUIPMENT



GENERAL

This equipment consists of current distribution and control panel, motor generator and storage battery. The apparatus is used in physics, chemistry, biology and electrical laboratories, and any other places where electricity is desired for experimental purposes.

PANEL

The experimental board consists of a jack panel and a control panel. The jack panel is furnished with a double pole receptacle for the termination of each table circuit, also current supply jacks for low and high voltages D.C. and A.C. The arrangement is such that all table circuits may be furnished with the same or different voltages simultaneously. This is accomplished by plugging flexible connectors from current supply jacks into the table circuit jacks.

The control panel contains all necessary voltmeters, ammeters, switches, transformer, rheostats, etc., for the control of the motor generator and charging of storage battery. The cut shows a 12-table circuit panel.

MOTOR GENERATOR

The motor generator is furnished usually to supply high voltage D.C. where this is not otherwise available in the building. The size and type of machine depends entirely upon needs of the institution.

STORAGE BATTERY

Storage batteries of various capacities and number of cells are furnished to give the range of low D.C. voltages. Taps are taken off the battery at various points and connected to the battery jacks on panel.

FLEXIBILITY

This equipment has a great flexibility of use in that various groups of students may work on different experiments requiring different currents at the same time. The apparatus appeals to all people who teach electricity. Panels are designed and built to meet the particular requirements of the school in which they are installed.

We are always glad to make suggestive layouts and submit prices covering special needs.

Ask for literature or our representative to call.

See pages 127 and 325 for electric clock and fire alarm systems.

WESTON ELECTRICAL INSTRUMENT CORP.

591 Frelinghuysen Avenue, NEWARK, N. J.

Albany	Cleveland	Knoxville	Pittsburgh	Seattle
Atlanta	Dallas	Los Angeles	Portland	Spokane
Boston	Denver	Minneapolis	Rochester	Syracuse
Buffalo	Detroit	New Orleans	St. Louis	Tacoma
Chicago	Houston	New York	San Antonio	Tampa
Cincinnati	Jacksonville	Philadelphia	San Francisco	

THE WORLD'S SCIENTIFIC STANDARDS

Wherever electrical tests are made, there is no single measurement which does not derive its authenticity, somewhere in the process, from an original Weston discovery or development. The use of Weston instruments in school and science laboratories has become as thoroughly established as the art of measurement itself. It is a fixed principle that only "Westons" should be used in the study of electrical science just as Ohm's Law is a fundamental part of the student's educational groundwork. Only the most exacting standards of accuracy and the highest expressions of craftsmanship should be offered the student as inspirational examples of the precise work which makes for progress and success in the electrical profession. And that means "Westons"—the instrument standards of the world. Following are a few of the Weston models which are particularly recommended for school equipment.

MODEL 280 MINIATURE PRECISION INSTRUMENTS

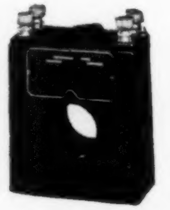
A complete line of D. C. portable instruments in wide demand because of their compact, sturdy construction and reliability. Made as voltmeters, ammeters, volt-ammeters, millivoltmeters and milliammeters. Accuracy, 1%.

MODEL 375 STUDENT GALVANOMETER

Portable type — durable —reasonably sensitive, and moderately priced. Resistance, approximately 25 ohms. Size, 3½" x 3¼" x 3½". Mounted on handsome base and finished in dull black japan.

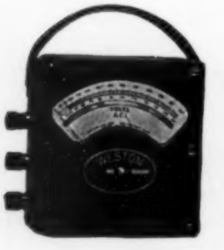
MODEL 461 PORTABLE CURRENT TRANSFORMER

For use with Model 433 portable ammeter shown in the illustration below. For general testing where compactness and portability are essential. Maximum secondary burden, 5 volt-amperes. Frequency, 25 to 133 cycles.



MODEL 539 NEW MINIATURE CURRENT TRANSFORMER

For use with Model 528 portable A. C. ammeter shown in the illustration below. Contained in mottled black and red bakelite case to match. A marvelously constructed portable instrument for compactness and convenience in testing. Used in connection with a one-ampere instrument, it is possible to measure currents from 0.2 amp. to 200 amps.



THE "JUNIOR" LINE OF A. C. PORTABLE PRECISION INSTRUMENTS

Model 433 single, double and triple range voltmeters—and single and double range ammeters and milliammeters. Black bakelite cases, shielded from external magnetic fields. For general A. C. testing where light and compact instruments are desired.

MODELS 528 AND 489 MINIATURE PORTABLE A. C. AND D. C. INSTRUMENTS

A handy miniature line of wide utility, accuracy 2%. For D. C. service made as single and double range ammeters and double and triple range voltmeters, with self-contained resistances of 1000 or 125 ohms per volt. For A. C. service made as double and triple range voltmeters and single range ammeters and milliammeters. Excellent electrical characteristics and incomparable workmanship. Bakelite cases.

MONOGRAPH B-7 FREE TO SCIENCE INSTRUCTORS

Containing a full exposition of the principles of the Permanent Magnet Movable Coil and Movable Iron types of instruments, together with a treatise on experimental electrical testing and innumerable examples.

THE CENTRAL SCIENTIFIC COMPANY

has been appointed wholesale distributor and service bureau to educational institutions. Weston instruments can be obtained from the leading apparatus dealers in whose catalogs they will be found listed.

Section IX

CHEMICAL INDEX

The following index lists the chemicals currently used in the laboratory and research work of schools and colleges, together with the names of some of the principal suppliers. Addresses and additional information will be found on pages 449–457.

The grades in which the manufacturers state that they are prepared to furnish their chemicals have been classified as follows:

1 — *Manufacturer's highest grade of reagent chemicals (C. P. grade).*
2 — *A grade suitable for most laboratory uses, although below C. P. quality (U. S. P. grade).*
3 — *A good commercial quality (Technical grade).*

CHEMICAL	J. T. Baker Chemical Co.†	Eastman Kodak Co.°	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Acacia (Gum Arabic)	1	....	....	....	....	....	....	....
Acetaldehyde	....	1-2	....	....	....	1	1	....
Acetamide	2	1	....	....	1	1	1	....
Acetanilide (Antifebrin)	2	1	....	....	2	....	1	....
Acetic Anhydride	1-2-3	1-2	1	....	1	1	1	....
Acetone	1-2	1-2	1-2-3	....	1*-1	....	1	....
Acetphenetidin (Phenacetin)	1	1	....	....	2	....	....	....
Acetyl Chloride	....	2	1-2	....	2	....	1	....
Acid Acetic, Glacial 99.5%	1-2	1	1-2-3	1	1*-1	....	1-2	....
Acetic Glacial Conf. to Dichromate Test	1	....	1	....	1*	....	1	....
Acetic, Spec. for Shellac Anal	1	....	1	....	....	....	....	....
Acetic 36%	2	....	2	3	1*-1-2	....	1-2	....
Arsenic H_3AsO_4	....	....	1	....	1	1	....	....
Acetylsalicylic (Aspirin)	2	1	....	....	2	....	....	....
Anthranilic	....	1	....	....	....	....	....	....
Arsenic	1-2	....	1	....	2	1-2	1	....
Arsenious	1-2-3	....	1	....	1*-1	1-2-3	1	....
Benzoic	1-2	1	....	....	1*-1	....	1	....
Boric, Cryst. & Po.	2	....	....	....	1*-1	1	1	....
Boric, Cryst	1	....	1	....	1*	1	1	....
Boric, Anhyd	....	....	....	....	1*	1	1	....
Butyric	1	1-2	....	....	2	....	1	....
Carbolic, Cryst	1-2	1	1-2	....	1*-1	....	1	....
Carbolic, Liquid	2	....	....	....	2	....	1	....
Chloroacetic (di-Mono-Tri-)	....	1	....	....	....	1	1	....
Chloroplatinic	1	....	1	....	2	....	1	....
Chromic	1-2-3	....	1-2	3	1*-1	1	1	....
Cinnamic	....	1	....	....	2	....	....	....
Citric, Cryst	1	1	1	....	....	....	1	....
Citric, Cryst. & Po	1-2	....	....	....	1*-1-2	....	1	....
Formic, About 85%	1-2-3	2	(90 & 50%) 1	3	1	1	1	....
Gallic	1	1	....	....	1*-2	....	1	....
Glycerophosphoric	....	....	....	....	2	....	....	....
Hippuric	....	1	....	....	3	1	....	....
Hydriodic	2	2	....	....	2	....	1	....
Hydrobromic 40%	....	2	(42%) 1	....	1*-1	1	1	....
Hydrobromic 34%	1-2	....	....	....	2	1	....	....
Hydrochloric (Muriatic)	3	....	1-2-3	3	2-3	....	3	....
Hydrochloric Sp. Gr. 1.18–1.19	1	....	1	1	1*-1-2	....	1-2	....
Hydrochloric fr. fr. Arsenic	1	....	1	1	1*	....	1	....
Hydrocyanic	....	....	....	....	2	....	....	....
Hydrofluoric 52–55%	1-3	....	3	....	2	....	2-3	....
Hydrofluoric 48%	3	....	1-3	....	1*-1	....	1-2-3	....
Hydrofluoric 52% & 60% & Etching Acid	....	....	2	....	....	....	....	....
Hydrofluorsilic, 27–30%	1	....	1	....	1	....	1-3	....
Hydrophosphorous	....	....	....	....	2	....	....	....
Hypophosphorous	1-2	....	....	....	2	1-2	....	....
Iodic, Cryst	1	....	1	....	1	....	1	....
Iodic, Anhydr	1	....	....	....	2	....	1	....

† "C. P. Baker's Analyzed" Chemicals are indicated as No. 1.
§ The General Chemical Co. have used No. 1 to indicate their Baker & Adamson Reagent Quality and No. 2 the Baker & Adamson Fine Chemicals.
* Merck & Co., Inc.'s "Blue Label Reagents."
° Eastman Grade No. 1 is specified on the basis of boiling, melting or decomposition temperatures.

CHEMICAL	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Acid Lactic, 85%	1-2	2	1	1-3	1*-1-2	2	1	....
Malic	....	1	....	....	2	....	....	....
Malonic	....	1	....	....	....	....	....	....
Molybdic, 85%	1-2	....	1	....	1*-1	1	1	....
Molybdic, Anhydr., 99.5-100%	1	....	1	....	1*-1	1	1	....
Monochloracetic	1	1	....	....	1	1	1	....
Nitric, Sp. Gr. 1.42	1	....	1-3	1-3	1*-1-2	....	1-3	....
Nitric, Fuming	1	....	1	3	1	....	1	....
Nucleic	....	1	....	....	3	....	....	....
Oleic	2	2	2	....	2	1	....	....
Osmic	....	1	....	....	2	....	....	....
Oxalic, Cryst	1-2	1	1-2	....	1*-1-2	1	1	....
Perchloric 60%	1	1	....	....	1	1	1	....
Perchloric 20%	1	....	1	....	1	1	1	....
Phosphomolybdic	1	....	....	....	1	1-2	1	....
Phosphoric, 85%	1-2	....	1-2	....	1*-1-2	1-2	1	....
Phosphoric (Glacial) Meta Sticks	1	....	....	....	1*-1	1	1	....
Phosphoric, Anhydr	1	....	1	....	1*-1	1	1	....
Phosphorous C. P. Cryst	....	....	1	....	....	1	....	....
Phosphotungstic, Cryst	1-2	....	....	....	1	1-2	1	....
Phthalic, Anhydr	1-2	1	....	....	1	....	1	....
Picric	1	1-2	1	....	1-2	....	1	....
Picramic	1	1	....	....	....	....	....	....
Propionic	....	1	....	....	....	....	1	....
Pyrogallic	1-2	....	1	....	1-2	....	1	....
Pyroligneous	2	....	....	....	2	....	....	....
Rosolic	1	....	....	....	1*	....	....	....
Salicylic	1-2	1	1	....	1-2	....	1	....
Selenic and Selenious	....	....	....	....	....	....	1	....
Silicic	1	....	....	....	1	1	1	....
Silicotungstic	1	....	....	....	1	1	1	....
Stearic	2	1-2	1	....	2	1	1	....
Succinic	1-2	1	....	....	1	1-2-3	1	....
Sulphanilic	1-2	1	1	....	1	....	1	....
Sulphosalicylic	....	1	....	....	1	....	....	....
Sulphuric	1-2-3	....	1-3	1-3	1*-1-2	....	1	....
Sulphurous	1	....	1	....	1*-1	....	1	....
Tannic	1-2	....	1	....	1-2	....	1	....
Tartaric, Cryst	1	1	1	....	1-2	....	1	....
Tartaric, Po	1-2	....	1	....	1-2	....	1	....
Trichloracetic	1-2	1	....	....	1	1	1	....
Tungstic	2	....	....	....	2	1	1	....
Valeric	....	1	....	....	2	1	....	....
Aconitine	....	....	....	....	2	....	....	....
Adeps Lanae	....	....	....	....	2	2-3	....	....
Agar-Agar	2	....	....	....	2	....	1	....
Agaricin	....	....	....	....	2	....	....	....
Albumin, Egg	1	....	....	....	2	....	....	....
Alcohol, Amyl	1-2	1	1	....	1*-1	1	1	....
Benzyl	....	1	....	....	1	1	....	....
Butyl	....	1-2	....	....	....	....	....	....
Capryl	....	1	....	....	....	....	....	....
Ethyl, Absolute, 99.8-100%	1	....	....	....	....	....	....	....
Iso-Butyl	....	1	....	....	....	....	....	....
Isopropyl	....	1	....	....	....	....	....	....
Methyl, 95%	1-(97%)	1	2	....	2	....	1-2	....
Methyl, Absolute Acetone Free	1	1	1	....	1*-1	....	1	....
Alizarine Paste	....	3	....	....	2	....	....	....
Alloys, Devardas, for Reductions	....	....	1	....	1*	....	1	....
Aloin	2	....	....	....	2	....	....	....
Alpha-Naphthylamine	....	1-2	....	....	2	....	1	....
Alum, Ammonium	1-2	....	1-2-3	3	1-2	1	1	....
Ammonium Chrome	2-3	....	1	3	2	....	1	....
Ammonium Potash	....	....	....	3	1-2-3	1	1	....
Potash Chrome	....	....	....	....	2	1	1	....
Aluminum (Metal)	1	....	1	....	2	....	1	....
Acetate	1-2	....	1	....	1	1-2	1	....
Chloride, Hydrated	....	....	1	3	1	1	1	....
Chloride, Anhydrous	1	....	1	....	1	1	1	....
Fluoride	1	....	1	....	1	1	1	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Aluminum Hydroxide	1	....	1	....	1	1	1	....
Nitrate	1-2	....	1	....	1	1-2	1	....
Oxide, Ignited	1-2	....	1	....	1	1	1	....
Phosphate	1	....	....	....	1	1	1	....
Potassium Sulphate	1-2	....	1-2-3	....	1-2	1	1	....
Sodium Sulphate	1-2	....	....	....	2	1	1	....
Sulphate	1-2-3	....	1-2-3	3	1-2	1	1	....
Aluminum & Ammonium Sulphate, Cryst	1	....	1-2	3	1-2	1	1	....
Aluminum & Potassium Sulphate, Cryst	1	....	1-2	....	1-2	1	1	....
Amidopyrine	....	....	....	....	2	....	....	....
Ammonia, Anhydr	....	....	....	3	....	....	....	....
Ammonia Water 28%	3	....	3	3	1*-1-2	....	1-2-3	....
Ammonium Acetate	2	....	1	....	1*-1	1	1	....
Arsenate	1	....	....	....	....	1	1	....
Benzoate	2	....	....	....	2	....	1	....
Bicarbonate	1-2	....	....	....	2	1	1	....
Bichromate	1-2-3	....	1	....	1-2	1-2-3	1	....
Bifluoride	2	....	....	....	1	1-3	1	....
Bisulphate	1	....	....	....	1	1	1	....
Bisulphite	1	....	1	....	2	....	1	....
Bitartrate	1	....	....	....	2	1	1	....
Borate	1-2	....	....	....	2	1	1	....
Bromide	1-2	....	1	....	1-2	....	1	....
Carbonate, Cubes	1	....	1	....	1-2	....	1	....
Carbonate, Lumps	1	....	1	....	1*-1-2	1	1	....
Chloride, Gran	1	....	1-2	3	1*-1-2	1	1	....
Chromate	1-2	....	....	....	1	1	1	....
Citrate	1-2	....	....	....	1	....	1	....
Dichromate	2-3	....	....	....	1-2	1-2-3	1	....
Fluoride	1-2	....	1	....	1	1	1	....
Formate	1	....	1	....	1	1	1	....
Hypophosphite	....	....	....	....	2	2	1	....
Hydroxide	1-2-3	....	1-2	1-3	1*-1-2	....	1	....
Iodide	1-2	....	....	....	1-2	....	1	....
Molybdate	1-2	....	1	....	1*-1-2	1	1	....
Nitrate	1-2-3	....	1-2-3	....	1*-1-2	1	1	....
Oxalate	1-2	....	1-2	....	1*-1	1-3	1	....
Persulphate	1-2	....	1-2	....	1*-1-3	....	1	....
Phosphate Monobasic	1-?-3	....	1	....	1	1	1	....
Phosphate Dibasic	1-2-3	....	1	2-3	1*-1	1	1	....
Phospho-Molybdate	1	....	....	....	2	1	1	....
Salicylate	2	....	....	....	2	....	1	....
Sulphate	1-2-3	....	1-2-3	....	1*-1	1	1	....
Sulphocyanate	....	....	1	....	1*-1	1-3	1	....
Sulphide Solution	1	....	1-2	3	1-3	....	1	....
Tartrate	1-2	....	1	....	1	1	1	....
Valerate	....	....	....	....	2	....	....	....
Amygdalin	....	....	....	....	2	....	....	....
Amyl Acetate	2	1-3	....	....	2	....	1	....
Alcohol	....	1	1	....	1	1	1	....
Butyrate	....	3	....	....	2	....	....	....
Nitrate	....	1	....	....	2	....	....	....
Salicylate	....	1	....	....	2	....	....	....
Valerate	....	3	....	....	2	....	....	....
Analytical Chemicals	1-2-3	1	1-2-3	....	1-2-3	1-2-3	1	....
Anethol	....	1	....	....	2	....	....	....
Aniline	....	1-2	1	....	1-3	....	1	....
Hydrochloride	1-2	1	1	....	1	....	1	....
Sulphate	....	1	....	....	2	....	1	....
Anthracene	1	1-3	....	....	....	....	1	....
Anthraquinone	....	1	....	....	....	....	....	....
Antimony, Metal	1	....	1	....	2	1-3	1	....
Chloride	1	....	....	....	1	1	1	....
Oxide	1	....	1	....	1-2	1	1	....
Potassium Tartrate	1-2	....	1	....	2	1	1	....
Sulphate	1	....	1	....	....	1	1	....
Antipyrine	....	....	....	....	2	....	....	....
Apomorphine-Hydrochloride	....	....	....	....	2	....	....	....
Arbutin	....	....	....	....	2	....	....	....
Arabinose	....	....	....	....	2	....	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company
Arecoline Hydrobromide	....	....	....	....	....	....	....
Arsenic, Metal	1	....	1	....	2	2	1
Bromide	....	....	....	....	2	1	1
Sulphide	1	....	....	....	2	1-3	1
Trioxide	1-2-3	....	1	....	1*-1-2	1-2-3	1
Arsphenamine	....	....	....	....	2	....	....
Asbestos	1	....	1	....	....	....	1
Asparagin, Pure	....	....	....	....	2	....	....
Atropine and Salts	....	....	....	....	2	....	....
Azolitmin	....	....	....	....	1*	....	....
Balsam, Fir, Canada	1	....	....	....	....	....	....
Peru	....	....	....	....	2	....	....
Barium Acetate	1-2	....	1	....	1	1-2	1
Bromate	....	....	....	....	....	1	1
Bromide	....	....	....	....	2	1	1
Carbonate	1-2-3	....	1	....	1*-1	1	1
Chlorate, Cryst	2	....	1	....	1	1	1
Chloride, Cryst	1-2-3	....	1-2-3	3	1*-1	1	1
Chromate	1	....	....	....	....	1	1
Dioxide	1-2	....	1	....	1	1	1
Fluoride	1	....	1	....	1	1	1
Hydroxide, Cryst	1-2-3	....	1	....	1*-1-2	1	1
Hydroxide, Dried	1-2	....	....	....	1*-1	1	1
Nitrate, Cryst	1-2	....	1	....	1-2	1-2	1
Peroxide	1-2	....	....	....	2	1	1
Sulphate (not X-ray)	1-2	....	1	....	1-2	1	1
Sulphide	2	....	....	....	2	1-2-3	1
Sulphite	1	....	....	....	....	1	1
Benedict's Qualitative Solution	....	....	....	....	2	....	....
Benzaldehyde	2-3	1	....	....	2	2	1
Benzene	1-2	1-2	1-2-3	....	1*-1-2	1	1
Benzidine	1	1-2	....	....	1*-1	....	....
Benzoyl Chloride	1	1	....	....	2	....	1
Benzyl Alcohol	....	1	....	....	1-2	1	....
Benzoate	1	1	....	....	2	....	....
Chloride	1	1-2	....	....	1-2	....	....
Benzin	1	....	....	....	1	....	....
Beta-Naphthol	2	1-3	1	....	2	....	1
Beta-Naphthol Benzoate	....	1	....	....	2	....	1
Beta-Naphthylamine	....	1-3	....	....	....	....	1
Bismuth, Metal	1	....	1	....	1-2	....	1
Acetate	1	....	....	....	....	....	1
Beta-Naphthol	....	....	....	....	2	....	....
Chloride	1-2	....	1	....	1	....	1
Citrate	....	....	....	....	2	....	1
Nitrate	1-2	....	1	....	1	....	1
Oxide, Hydr	1	....	....	....	1	....	....
Oxychloride	1-2	....	....	....	1	....	....
Subnitrate	1-2	....	1	....	1-2	....	1
Subcarbonate	1-2	....	....	....	1-2	....	1
Subgallate	2	....	....	....	2	....	1
Subsalicylate	....	....	....	....	2	....	....
Bleaching Powder	1-2	....	3	3	....	....	1-3
Bromine	1-2	....	1	....	1*-1-2	1-2	1
Bromphenol Blue	....	1	....	....	....	....	....
Bromoform	2	1	....	....	2	....	....
Bromthymol Blue	....	1	....	....	....	....	....
Brucine	....	....	....	....	2	....	....
Butyl Alcohol	....	1-2	....	....	2	....	....
Butyl Chloral Hydrate	1	....	....	....	2	....	....
Cadmium (Metal)	1	....	1	1-3	2	....	1
Acetate	1-2	....	....	....	1	1	1
Bromide	1-2	....	....	....	1-2	1	1
Carbonate	1-2	....	1	....	1	1	1
Chloride	1-2	....	1	....	1*-1-2	1	1
Iodide	1	....	....	....	2	....	1
Nitrate	1-2	....	1	....	1-2	1	1
Potassium Iodide	....	....	....	....	....	....	1
Sulphate	1-2	....	1	....	1-2	1	1
Caffeine	2	1	....	....	2	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company
Caffeine Citrated	2	....	....	....	2	....	....
Calamine	2	....	....	....	2	....	....
Calcium (Metal)	1	....	....	....	2	1	....
Acetate	1-2-3	....	1	....	1-2	1-2	1
Arsenate	1	....	....	3	3	1	1
Arsenite	....	....	....	....	3	1	1
Bromide	1-2	....	....	....	1	1	1
Carbide	1	....	2	....	....	....	1
Carbonate	1-2	....	1-2	....	1*-1-2-3	1	1
Chloride, Cryst	1	....	1	....	1	1-2-3	1
Chloride, Dry	1-2-3	1	1-2	3	1*-1-2	1-2-3	1
Fluoride	1-2	....	1-2	....	1	1	1
Formate	1-2	....	....	....	1	1	1
Glycerophosphate	1-2	....	....	....	2	....	....
Hypochlorite	1-2	....	3	....	....	1	1-3
Hypophosphite	1	....	....	....	2	1	1
Iodide	1-2	....	....	....	2	....	1
Lactate	2	....	1	....	2	1-2	1
Lactophosphate	1	....	....	....	2	1-2	....
Nitrate	1-2	....	1	....	1	1	1
Oxalate	1-2	....	....	....	2	1	1
Oxide	2	....	1-2	....	1*-2	1-2	1
Phosphate, Primary	1	....	1	....	1-2	1	1
Phosphate, Secondary	1-2	....	1	....	1-2	1	1
Sulphate	1-2-3	....	....	....	1-3	1-2	1
Sulphide	2	....	....	....	2	1-2	1
Sulphocarbolate	1	....	....	....	2	....	....
Calomel	1-2	....	....	....	1*-1-2	....	1
Camphor	2	1	....	....	....	....	1
Monobromated	2	1	....	....	2	2	....
Carbon	1	....	....	....	....	....	1
Decolorizing (Activated Charcoal)	1	1	1	....	....	....	2-3
Disulphide	1-2-3	....	1-2-3	....	1*-1-2	....	1
Tetrachloride	1-2-3	1-2	1-2-3	....	1*-1-2	....	1
Carborundum	1	....	....	....	....	....	3
Carmine	....	....	....	....	1*	....	....
Casein	3	1	....	....	3	....	....
Catechol	....	1	....	....	....	1	....
Cerous Oxalate	....	....	....	....	2	2	....
Cotyl Alcohol	....	1	....	....	....	....	....
Charcoal	1	....	1	....	2	....	1-3
Chemicals, Analytical	....	....	1-2	....	....	1-2-3	1
for Reagent or Laboratory Purposes	....	1	1-2	....	1*-1-2	1-2	1
Chloral Hydrate	2	1	....	....	2	2	1
Chloramine	....	1	....	....	....	....	....
Chlorphenol, Red	....	1	....	....	....	....	....
Chloroform	1-2	1	1-2	....	1*-1-2	....	1
Chlorophyll	....	....	....	....	2	2	....
Cholesterol	....	1	....	....	2	1	....
Chromium Chloride	1-2	....	1	....	1	1	1
Nitrate Solution	1	....	....	....	1-2	1	1
Oxide	1	....	....	....	1*	1-3	1
Potassium Sulphate, Cryst	1-2-3	....	1-2	....	1*-1-2	1	1
Sulphate	1-2	....	1	....	1-2	1	1
Trioxide	1-2-3	....	1-2	....	1*-1-2	1	1
Cinchona Bark	....	....	....	....	2	....	....
Cinchonidine	1	....	....	....	2	....	....
Cinchonine	....	1	....	....	2	....	....
Cinnamic Aldehyde	....	1	....	....	2	....	....
Cobalt (Metal)	1	....	....	....	2	....	1
Acetate	1	....	....	....	1	1	1
Carbonate	1	....	....	....	2	1	1
Chloride	1-2	....	1	....	1	1	1
Nitrate	1-2	....	1	....	1*-1	1	1
Oxide	1-2	....	1	....	2	1	1
Sulphate	1-2	....	....	....	1	1	1
Cocaine	....	....	....	....	2	....	....
Cochineal	1	....	....	....	....	....	1
Codeine	....	....	....	....	2	....	....
Colchichine	....	....	....	....	2	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Collodion	2	....	....	....	1-2	....	....	
Colloidal Iron	....	....	....	....	2	....	....	
Commercial Chemicals	1-2-3	....	2-3	3	3	1-2-3	....	
Congo Red	1	....	....	....	1*	....	1	
Copper (Metal)	1	....	1	....	....	1	1	
Acetate	1-2-3	....	1-2	....	1	1	1	
Ammonium Chloride	1-2	....	1	....	1*-1	1	1	
Arsenate	1	....	....	....	2	1	1	
Arsenite	1-2	....	....	....	2	1	1	
Bromide	1-2	....	1	....	1	1	1	
Carbonate	1-2-3	....	1	....	1	1	1	
Chloride	1-2	....	1	....	1*-1	1-2	1	
& Potassium Chloride	1	....	1	....	1	1	1	
Iodide	2	....	....	....	2	....	1	
Nitrate	1-2-3	....	1	....	1-2	1-2	1	
Oxalate	1-2	....	....	....	2	1	1	
Oxide, Black Gran	....	....	....	....	1	1	1	
Oxide, Black Powd	1-2-3	....	1	....	1*-1	1	1	
Oxide, Red Powd	1-2-3	....	1-2	....	1	1	1	
Oxide, Wire Form	....	....	1	....	1	1	1	
Phosphate	1	....	....	....	2	1	1	
Sulphate, Crys	1-3	....	1-2-3	3	1*-1-2-3	1	1	
Sulphate, Powd. Anhyd	1-2	....	1	3	1	1-2	1	
Coumarin	....	1	....	....	2	....	....	
Creosote (Wood Creosote)	2	....	....	....	2	....	....	
Carbonate	2	....	....	....	2	....	....	
Cresol	2	2	....	....	2	....	....	
Cupferron	....	1	1	....	....	....	1	
Curcumin	....	1	....	....	....	....	....	
Daturine and Salts	....	....	....	....	2	....	....	
Dextrin	3	1-2-3	....	....	1-2	....	1	
Dextrose, "C. P." Anhyd	1	1-2	1	....	1	....	1	
Devardas Metal	....	....	1	....	1*	....	1	
Dichloramine	....	1	....	....	....	....	....	
Diethyl Phthalate	....	1	....	....	....	....	....	
Dimethylamine Benzaldehyde	....	1	....	....	....	....	....	
Dimethylgloxime	2	1	1	....	1*	1	1	
Dimethylsulphate	2	2	2	....	....	....	1	
Diphenylamine	2	1-2	1	....	1*	....	1	
Dipotassium Hydrogen Phosphate	....	....	....	....	1*	1	1	
Dulcit	....	....	....	....	2	....	....	
Egg, Albumin	....	....	....	....	2	....	1	
Ergotin	....	....	....	....	2	....	....	
Eschka's Mixture	....	....	1	....	1*	1	1	
Eserine	....	....	....	....	2	....	....	
Ether (Sulphuric Ether)	2	....	2	....	1*-2	....	1	
U.S.P. for Anaesthesia	2	....	....	....	2	....	2	
Anhydrous, Distilled over Sodium	1	1	1	....	1*-1	1	1	
Petroleum (Ligroin)	....	....	1-2	....	1-2	....	1-2-3	
Ethyl Acetate	1-2	1-2	1	....	1-2	....	1	
Acetoacetate	....	1	....	....	....	....	....	
Benzoate	....	1	....	....	2	....	1	
Bromide	2	1	1	....	1	....	1	
Butyrate	3	1-3	....	....	2	....	....	
Chloride	....	1	....	....	....	1	....	
Ethylhydrocupreine	....	....	....	....	2	....	....	
Ethyl Iodide	2	1	....	....	2	....	....	
(Iso) Valerate	....	1	....	....	2	....	....	
Pelargonate	....	1	....	....	....	....	....	
Propionate	....	1-3	....	....	....	....	....	
Salicylate	....	1-2	....	....	2	....	....	
Ethylene Dichloride	....	1	....	....	....	....	....	
Glycol	....	1	....	....	....	....	....	
Eucalyptol	....	....	....	....	2	....	....	
Eugenol	....	1-2	....	....	2	....	....	
Filter Paper	1	....	1	....	....	....	1	Eaton-Dikeman Co.
Formaldehyde	....	2	2	....	1*-2	....	1	
Furfural	....	1-2	....	....	2	....	1	
Galactose	....	1	....	....	2	....	....	
Gelatin	1	....	....	....	....	1-2-3	....	

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company
Galena Crystals	1	....	....	....	....	....	....
Glass Wool	1	....	1	....	2	1	1
Glucose, Pure	3	1	....	....	1	....	....
Glycerin	1–2	1	1	....	1*–1–2	....	1
Gold Bromide	....	....	....	....	2	....	....
Chloride	2	....	....	....	1*–2	....	....
& Sodium Chloride	....	....	....	....	2	....	....
Guaiacol	2	1–3	....	....	2	....	....
Carbonate	2	....	....	....	2	....	....
Gums (All kinds)	1	....	....	....	....	....	....
Gypsum	1	....	....	....	....	....	....
Heliotropin	....	1	....	....	2	1	....
Hematoxylin	....	1	....	....	....	....	....
Hexamethylenetetramine	....	1	....	....	2	....	....
Hide, Powder	1	....	....	....	....	....	1
Histamine (Ergamine Acid Phosphate); Histidine Dichloride	....	1	....	....	....	....	....
Homotropine	....	....	....	....	2	....	....
Hydrastine	....	....	....	....	2	....	....
Sulphate	....	....	....	....	2	....	....
Hydrazine Sulphate	....	1	....	....	1*–2	....	....
Hydrogen Ion Indicators	....	1	....	....	....	....	....
Peroxide 30%	1–2	....	1–2	....	1*–1	....	1
Sulphide Water	....	....	....	....	2	....	1
Hydroquinone	....	1	....	....	2	....	....
Hydroxylamine Hydrochloride	2	1	....	....	1*	1	....
Hyoscine (Scopolamine)	....	....	....	....	2	....	....
Ichthyol	....	....	....	....	2	....	....
Indicators, Oxidation-Reduction	....	1	....	....	....	....	....
Indigo, Carmine	1	....	....	....	2	....	....
Inulin	....	....	....	....	2	....	....
Iodeosin	....	1	....	....	1*	....	....
Iodine	1–2	....	1	....	1*–1–2	....	1
Tincture	....	....	....	....	2	....	....
Trichloride	....	....	1	....	2	....	1
Iodoform	2	1	....	....	2	....	....
Iron (Metal)	....	....	1	....	2	1–2	1–2–3
Acetate	1	....	....	....	2	1	1
Albuminate	....	....	....	....	2	....	....
& Ammonium Citrate	2	....	....	....	2	....	1
& Ammonium Oxalate	1–2	....	....	....	1–2	1–2	1
& Ammonium Sulphate	1–2	....	1	....	1*–1	1	1
Iron by Hydrogen	1	....	1	....	2	1	1
Chloride	1–2	....	1	....	1*–1–2	1–2	1
Citrate	2	....	....	....	2	....	1
Ferrocyanide	....	....	....	....	2	....	....
Filings	1	....	1	....	2	....	1
Glycerophosphate	....	....	....	....	2	....	....
Hypophosphite	2	....	....	....	2	2	....
Iodide	2	....	....	....	2	....	....
Nitrate	1	....	1	....	1*–1	1	....
Oxalate	1–2	....	....	....	2	1	1
Oxide	1–2–3	....	1	....	2	1–3	1
Peptonate	....	....	....	....	2	....	....
Phosphate	1–2	....	....	....	2	1	1
Pyrophosphate	....	....	....	....	2	....	1
Sulphate	1–2–3	....	1–2	....	1*–1–2	1–2–3	1
Sulphide Lumps or Sticks	1	....	1–2–3	....	2	1	1
Wire No. 30 for Standardizing	1	....	1	....	1*	....	1
Kaolin	1–2	....	....	....	3	....	....
Lacmoid	....	1	....	....	1*	....	....
Lactose	1–2	1–2	....	....	2	....	1
Lead Metal	1	....	1	....	2	....	1
Free from Ag	1	....	1	....	1	....	1
Acetate	1–2–3	....	1–2–3	3	1–2	1–2–3	1
Acetate, Neutral	1	....	1–3	....	1*–1	1–2–3	1
Arsenate	1–2	....	....	3	2	1	1
Arsenite	....	....	....	....	2	1	1
Acetate Basic Sugar Anal	1	....	1	....	1	....	1

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Lead Borate	1-2	....	....	....	1	1	1	....
Bromide	....	....	....	....	2	1	1	....
Carbonate	1-2	....	1	....	1	1	1	....
Chloride	1-2	....	1	....	1	1	1	....
Chromate	1-2	....	1	....	1	1	1	....
Iodide	1-2	....	....	....	2	....	1	....
Lactate	....	....	....	....	....	....	1	....
Nitrate	1-2-3	....	1	....	1	1	1	....
Oxide, Brown Manganese Free	....	....	....	....	1	1-3	1	....
Oxide, Brown for Ultimate Anal	....	....	....	....	1*	1	1	....
Oxide	1-2	....	1	....	1	1	1	....
Oxide, Yellow	2	....	1-2	....	1-2	1	1	....
Peroxide	1-2	....	1-2	....	2	1-3	1	....
Phosphate	1	....	....	....	1	1	1	....
Refined	....	....	....	....	1	....	1	....
Subacetate, Sol	1	....	....	....	2	....	1	....
Sulphate	1-2	....	1	....	1	1	1	....
Sulphide	1	....	....	....	....	1	1	....
Tartrate	1	....	....	....	....	1	1	....
Lecithin	....	2	....	....	2	2	....	....
Lithium Acetate	2	....	....	....	2	1	1	....
Benzoate	2	....	....	....	2	....	1	....
Bromide	2	....	....	....	2	....	1	....
Carbonate	1-2	....	1-2	....	1-2	1-2	1	....
Chloride	1-2	....	1	....	1	1	1	....
Citrate	2	....	....	....	....	....	1	....
Fluoride	1	....	1-2	....	....	....	1	....
Nitrate	1-2	....	1	....	1-2	1	1	....
Salicylate	2	....	....	....	2	....	....	....
Sulphate	1	....	....	....	1	1	1	....
Litmus Cubes	1	....	1	....	2	....	1	....
Paper, Blue, Red or Neutral	1	....	1	....	2	1	1	....
Magnesite	1-3	....	2	....	....	....	1	....
Magnesium (Metal)	1	....	1	....	2	....	1	....
Bromide	1-2	....	....	....	1	1	1	....
Carbonate	1-2	....	1	....	1*-1-2	1	1	....
Chloride, Cryst	1-2-3	....	1	....	1*-1-2	1	1	....
Citrate	1-2	....	....	....	2	....	1	....
Glycerophosphate	2	....	....	....	2	....	....	....
Hypophosphite	2	....	....	....	2	2	....	....
Iodide	....	....	....	....	....	....	1	....
Nitrate	1-2-3	....	1	....	1	1-2	1	....
Oxide, Sulphur Free	1	....	1	....	1*	1	1	....
Peroxide	2	....	....	....	2	....	1	....
Phosphate	1-2	....	....	....	2	1	1	....
Phosphate, Dibasic	....	....	....	....	2	1	1	....
Phosphate, Tribasic	....	....	....	....	2	1	1	....
Salicylate	2	....	....	....	2	....	1	....
Silicate	1	....	....	....	2	1	....	....
Sulphate	1-2	....	1-2	....	1*-1-2-3	1	1	....
Sulphate, Dried Anhyd	1-2	....	....	....	1	1	1	....
Malachite Green	....	2	....	....	2	....	....	....
Maltose	....	1	....	....	2	....	....	....
Manganese (Metal)	1	....	....	....	2	2	1	....
Acetate	1	....	....	....	2	1-3	1	....
Bromide	....	....	....	....	....	1	1	....
Carbonate	1-2	....	1	....	1	1	1	....
Chloride	1-2	....	1	....	1-2	1-2-3	1	....
Citrate	....	....	....	....	2	....	....	....
Dioxide	....	....	1-2	....	1-2	1	1	....
Glycerophosphate	....	....	....	....	2	....	....	....
Hypophosphite	....	....	....	....	2	2	....	....
Iodide	....	....	....	....	2	....	1	....
Nitrate	1	....	1	....	....	1	1	....
Nitrate, Liquid 50%	....	....	....	....	1	....	1	....
Phosphate	1	....	....	....	2	1	1	....
Sulphate	1-2	....	1	....	1-2	1-3	1	....
Marble Chips	....	....	2	....	....	....	1-3	....
Menthol	2	1	....	....	2	....	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Mercurous Chloride (Calomel)	2	....	1	....	1*-1-2	....	1	....
Chloride (Electrolytic for Standardization)	1-2	....	....	....	1	....	1	....
Mercury	2-3	....	1-2	....	1*-1-2-3	....	1	....
Acetate	2	....	1	....	1	....	1	....
Ammonium Chloride	....	....	....	....	2	....	1	....
Bichloride	1-2	....	1	....	1*-1-2	....	1	....
Blue Mass	....	....	....	....	2	....	....	....
Blue Ointment	....	....	....	....	2	....	....	....
Bromide	1	....	....	....	1	....	1	....
Cyanide	1-2	....	....	....	1	....	1	....
Iodide	2	....	....	....	1	....	1	....
Nitrate	1-2	....	1	....	1	....	1	....
Oxide Yellow	2	....	1	....	1*-1-2	....	1	....
Oxide Red	1-2	....	1	....	1-2	....	1	....
Sulphate	1-2	....	1	....	1	....	1	....
Sulphide Red	1-2	....	1	....	1	....	1	....
White Precipitate	....	....	....	....	2	....	....	....
& Potassium Iodide	....	....	....	....	2	....	1	....
Methylene Blue	2	1-2	....	....	1*-2	....	....	....
Methyl Acetate	....	1	2	....	....	....	1	....
Iodide	1	1	....	....	2	....	1	....
Orange	1	1	1	....	1*	1	1	....
Red	1	1	1	....	1*	1	1	....
Salicylate	1	1-2	....	....	2	....	1	....
Violet	....	1	....	....	2	....	....	....
Microcosmic Salts	1-2	....	1	....	1-2	1-2	1	....
Monomethyl-Para-Amido-Phenol Sulphate	....	2	....	....	2	....	....	....
Morphine	....	....	....	....	2	....	....	....
Morphine Ethyl	....	....	....	....	2	....	....	....
Naphthalene	1-2	1-2	....	....	2	....	1	....
Naphthol	1-2-3	1-2	1	....	2	....	1	....
Naphthylamine	1	1	....	....	....	....	1	....
Nessler's Solution	....	....	....	....	2	....	1	....
Neutral Red	....	1-3	....	....	....	....	....	....
Nickel Metal, Shot	1	....	1	....	2	....	1	....
Acetate	1-2	....	....	....	1	1-2	1	....
Ammonium Chloride	....	....	....	....	2	....	1	....
Ammonium Sulphate	1-2	....	1	....	1*-1	1-3	1	....
Bromide	....	....	....	....	2	....	1	....
Carbonate	1-2-3	....	1	....	1	1	1	....
Chloride	1-2-3	....	1	....	1-2	1	1	....
Nitrate	1-2	....	1-2	....	1	1	1	....
Oxide	1-2	....	1	....	2	1	1	....
Sulphate	1-2-3	....	1	....	....	1-3	1	....
Nicotine	....	1-2	....	....	....	....	....	....
Nitroso Betanaphthol	1-2	1	1	....	1	....	1	....
Nitrobenzene	1	1-2	2	....	2	....	1	....
Nitron	....	1	....	....	....	....	....	....
Nitrotoluene	....	1	....	....	....	....	....	....
Oenanthic Ether	....	1	....	....	....	....	....	....
Oil, Cottonseed	1	....	....	....	....	....	....	....
Mineral	....	....	....	....	2	....	....	....
Osmium	....	....	....	....	2	....	....	....
Pancreatin	....	....	....	....	2	....	....	....
Papain	....	....	....	....	2	....	....	....
Paper, Congo	....	....	....	....	....	1	1	....
Filter	....	....	1	....	....	....	1	Eaton-Dikeman Co.
Litmus	1	....	1	....	2	1	1	....
Phenolphthalein	....	....	....	....	....	1	1	....
Turmeric	....	....	1	....	....	1	1	....
Paraldehyde	2	1-2	....	....	2	....	....	....
Para-Aminophenol	....	1	....	....	....	....	....	....
Para-Dichlorbenzene	....	1-2	....	....	2	....	....	....
Paraffin	....	....	1	....	....	....	1-3	....
Para-Formaldehyde	....	1	....	....	2	....	....	....
Para-Nitrochlorobenzene	....	1-2	....	....	....	....	....	....
Pepsin	....	....	....	....	2	....	....	....
Peptone Witter's	....	....	....	....	2	....	....	....
Petrolatum	1	....	2	....	2	....	....	....
Pharmaceuticals	1-2-3	....	....	....	2	1-2-3	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company
Phenolphthalein	2	1	1	....	1*	....	1
Phenol	1-2	1	1	....	1*-1-2	....	1
Phenylhydrazine	1	1	....	....	2	1	1
Hydrochloride	1	1	....	....	2	....	1
Ph. Indicators	....	1	....	....	....	....	....
Phloroglucinol	....	1	....	....	1*	1	....
Phosphoric Anhydride	1	....	1	....	2	1	1
Phosphorus	2	....	....	....	2	....	....
Oxychloride	1	....	....	....	....	1	1
Pentachloride	1	....	1-2-3	....	....	1	1
Pentasulphide	1	....	....	....	....	1	1
Red Amorphous	1	....	1	....	2	2	1
Sticks Yellow	2	....	2	....	2	....	1
Trichloride	1	....	1	....	2	1	1
Phthalic Anhydride	....	1	....	....	1	....	1
Pilocarpine	....	....	....	....	2	....	....
Piperine	....	1	....	....	2	....	....
Plaster Paris	3	....	2	....	3	....	....
Platinum Chloride	1	....	1	....	2	....	1
Solutions	....	....	1	....	....	....	1
Potassium (Metal)	1	....	1	....	2	1	1
Acetate	1-2	....	1	....	1	1-2	1
Acid Phosphate	....	....	....	....	1	1-2	1
Acid Phthalate	....	....	....	....	1*	....	1
Arsenate	1-2	....	....	....	1	1	1
Arsenite	1-2	....	1	....	2	1	1
Bicarbonate	1-2	....	1	....	1*-1-2	1	1
Bichromate	1-2-3	....	1-2	....	1*-1	1	1
Biniodate	....	....	....	....	2	1	1
Binoxalate	1-3	....	1	....	1	1	1
Bisulphate, Fused	1- -3	....	1	....	1*-1	1	1
Bisulphate, Cryst	1-3	....	1	....	1-2	1	1
(meta) Bisulphite	1-2	....	1	....	1	1-3	1
Bitartrate, Cryst	....	....	....	....	1-2	....	1
Bitartrate, Po	1-2	....	1	....	1-2	....	1
Bromate	1-2	....	1	....	1*-1	1	1
Bromide	1-2	....	1	....	1*-1-2	....	1
Carbonate, Cryst	1	....	1	....	1-2	1	1
Carbonate, Po	2	1	1	....	1*-1-2	1	1
Chlorate, Cryst	1-2	....	1	....	1*-1-2	1	....
Chlorate, Po	2	....	....	....	1-2	....	1
Chloride	1-2-3	....	1	....	1*-1-2	1	1
Chromate	1-2	....	1	....	1*-1	1-3	1
Citrate	1-2	....	1	....	1-2	....	1
Cyanide	1-2-3	1	2	....	1-2	1-2-3	1
Ferricyanide	1-2-3	....	1-2	....	1*-1-2	1	1
Ferrocyanide	1-2	....	1-2	....	1*-1-2	1	1
Fluoride	1-2-3	....	1	....	1	1	1
Glycerophosphate	1	....	....	....	2	....	....
Hydroxide	1-2-3	....	1-2	....	1*-1-2	1-2	1
Hypophosphite	2	....	....	....	2	2	1
Iodate	1-2	....	1	....	1*-1	....	1
Iodide	1-2	1	1-2	....	1*-1-2	....	1
Iodide Neutral	....	....	....	....	2	....	1
Metabisulphite	1	....	....	....	2	1-3	1
(Metal) Balls	....	....	1	....	2	1	1
Nitrate	1-2	....	1	....	1*-1	1	1
Nitrite, Sticks	2	....	1	....	1-2	1-2	1
Oxalate, Neutral	2	....	1	....	1*-1	1	1
Perchlorate	1	....	....	....	1*-2	1	1
Permanganate	1-2	....	1-2	....	1*-1-2	1-2	1
Persulphate	1-2	....	....	....	1*-1	1	1
Phosphate, Monobasic	1-2	....	1	....	1*-1	1-2	1
Phosphate, Dibasic	1-2	....	1	....	1-2	1	1
Phosphate, Tribasic	1-2	....	....	....	1-2	1	1
Pyrophosphate	1	....	....	....	2	1	1
Silicate	....	....	....	....	2	1	1
Sodium Tartrate	1-2	....	....	....	1*-1-2	....	1
Sulphate, Cryst	1-2	....	1-2-3	....	1*-1-2	1-2	1
Sulphate, Po	2	....	....	....	1-2	1	1

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Potassium Sulphide	1	....	2	....	2	1	1	....
Sulphite	1-2	....	....	....	2	1	1	....
Sulphocyanide	1-2-3	....	1	....	1*-1	1	1	....
Tartrate, Cryst	1-2	....	1	....	1	1	1	....
& Sodium Tartrate, Cryst	1	....	1	....	1*-1-2	....	1	....
& Sodium Tartrate, Po	2	....	....	....	1-2	....	1	....
Procaine	....	....	....	....	2	....	....	....
Pyridine	1-3	1-3	....	....	1	....	1	....
Pyrogallol	1-2	1	1	....	1-2	....	1	....
Quinine	2	....	....	....	2	....	....	....
Raffinose	....	....	....	....	2	....	....	....
Reagents	1-2-3	....	1	....	1*-1	1-2-3	1	....
Blood	1-2-3	....	....	....	1*-1	....	....	....
Diagnostic	1-2-3	....	....	....	1-2	....	....	....
Resorcinol	2	1	1	....	1*-2	2	1	....
Saccharose	2	....	....	....	1-2	....	1	....
Saccharin	1-2	1	....	....	2	....	1	....
Sanguinarine Nitrate	....	....	....	....	2	....	....	....
Santonin	....	....	....	....	2	....	....	....
Saponin	....	....	....	....	2	1-2-3	....	....
Sea Sand	....	....	....	....	1	....	1-3	....
Selenium	....	....	1	....	2	1	....	....
Silicon Dioxide	....	....	....	....	....	1	1	....
Silver Acetate	....	....	....	....	2	....	1	....
Bromide	....	....	....	....	2	....	1	....
Chloride	1	....	....	....	2	....	1	....
Nitrate	1-2	1	1	....	1*-1-2	....	1	....
Sulphate	1	....	1	....	1*-1	....	1	....
Soda Lime No. 4 Mesh	1	....	1-2	....	1	1	1	....
Sodium, Metal	1	....	1	....	1*-2	1	1	....
Acetate, Cryst	1-2-3	....	1-2	....	1*-1-2	1-2	1	....
Acetate, Anhydr	1-2	....	1	....	1	1	1	....
Aluminum Sulphate	1-2	....	....	3	....	1	1	....
Amalgam	....	....	1	....	....	....	1	....
Ammonium Phosphate	1-2	....	1	....	1*-1	1-2	1	....
Arsenate	1-2	....	1	....	2	1	1	....
Arsenite	1-2	....	1	....	2	1	1	....
Benzoate	2	1	....	....	2	....	1	....
Bicarbonate	1-2	....	1-2	2	1*-1	1	1	....
Bicarbonate USP	2	....	....	2	2	....	2	....
Bichromate	1-2-3	....	1	3	2	1	1	....
Bismuthate	1-2	....	1	....	1*	....	1	....
Bisulphate, Cryst	1-2-3	....	1	....	1-2	1	1	....
Bisulphate, Fused	1-2-3	....	1	3	1	1	1	....
Bisulphite	1-2	1	1-2-3	3	1	1	1	....
Bitartrate	1-2	....	1	....	1-2	1	1	....
Borate, Cryst. & Po	2	....	1-2	....	1*-1-2	1	1	....
Bromate	1-2	....	....	....	1	1	1	....
Bromide	1-2	....	1	....	1	....	1	....
Calcium Hydrate	1	....	1-2	....	1*-1-2	1	1	....
Carbonate, Dried	....	....	....	....	1-2	1	1	....
Carbonate, Cryst	1-2-3	....	1-2	3	1*-1-2	1	1	....
Carbonate, Anhydr	1-2-3	....	1-2	3	1*-1	1-2	1	....
Chlorate	1-2	....	1	....	1-2	1	1	....
Chloride, Cryst. or Gran	1-2	....	1-2	....	1*-1	1	1	....
Chromate	1-2	....	1	....	1	1	1	....
Citrate	1-2	....	1	....	1-2	....	1	....
Cyanide	1-2-3	1	1	3	1*-1	....	1	....
Ethylate	....	....	....	....	....	....	1	....
Fluoride	1-2-3	....	1-2-3	3	1-2	1-3	1	....
Formate	1-2	....	....	....	1	1	1	....
Hydroxide, from Sodium	....	....	....	3	1*-1	1	1	....
Hydroxide Sticks (so-called By Alcohol)	1-2	....	1-2	....	1*-1	1-2	1	....
Hydrosulphite	1	....	....	....	....	....	1	....
Hypochlorite	....	....	1	....	....	....	1	....
Hypophosphite	1-2	....	....	....	2	1-2	1	....
Iodate	1	....	....	....	1	....	1	....
Iodide	1-2	....	1	....	1-2	....	1	....
Metal	....	....	1	....	1*-2	1	1	....
Molybdate	1-3	....	....	....	1	1	1	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Sodium, Nitrate, Cryst	1-2	....	1-2	....	1*-1	1	1	....
Nitrite, Sticks	1-2	....	1	....	1*-1-2	1-2	1	....
Nitric, Gran	2-3	1	2	....	1	1	1	....
Nitroprusside	1	....	1	....	1	1	1	....
Oleate	2	....	....	....	1-2	....	1	....
Oxalate	1-2-3	....	1	....	1-2	1	1	....
Oxalate Soerensen's fro. standardization	1	....	....	....	1*	1	1	....
Perchlorate	1-2	....	....	....	2	....	1	....
Peroxide	1-2	....	1	....	1*-1	....	1	....
Phosphate, Dibasic	....	....	1-3	2-3	1*-1-2	1	1	....
Phosphate, Monobasic	....	....	1	....	1-2	1	1	....
Phosphate, Tribasic	....	....	1-3	2-3	1-2	1	1	....
Phosphate	1-2-3	....	....	2-3	1*-1-2	1	1	....
Phosphate, Dibasic Anhydr	....	....	....	....	1*	1	1	....
Pyrophosphate	1-2-3	....	....	....	1*-1	1	1	....
Potassium Carbonate	1	....	....	....	2	1	1	....
Salicylate	1-2	1	....	....	1-2	....	1	....
Silicate	1	....	2-3	3	3	1	1-3	....
Silicofluoride	1	....	1	3	1	1-3	1	....
Succinate	1	1	....	....	2	....	1	....
Sulphate, Cryst	1-2	....	1-2-3	3	1*-1-2	1	1	....
Sulphate, Anhyd	1-3	....	1	3	1*-1-2	1	1	....
Sulphite	1-2	....	3	3	....	1	1	....
Sulphide	1-2	....	1-2-3	3	1*-1-2	1	1	....
Sulphite, Cryst	1-2	....	1-2-3	3	1-2	1	1	....
Sulphite, Anhydr	1	....	1-3	....	1	1	1	....
Tartrate	1-2	....	1	....	1	1	1	....
Thiosulphate, Cryst	1-2	....	1-2-3	3	1*-1-2-3	1	1	....
Thiosulphate, Anhydr	....	....	1	....	1-2	1	1	....
Thiocyanate	1-2-3	....	1	....	1-2	1-2	1	....
Tungstate	1-2	....	....	....	1*-1	1	1	....
Solutions, Volumetric	....	....	1	....	2	1	1	....
Solvents	....	1	....	....	....	....	1	....
Sparteine Sulphate	....	....	....	....	2	....	....	....
Starch, Arrowroot	1	....	1	....	....	....	1	....
Corn	1	....	....	....	....	....	1	....
Iodized	1	....	....	....	....	....	1	....
Potato	1	....	1	....	....	....	1	....
Soluble	1	....	1	....	1	1	1	....
Wheat	1	....	1	....	....	....	1	....
Strontium Acetate	1	....	....	....	1	1	1	....
Bromide	1-2	....	....	....	2	....	1	....
Carbonate	1-2-3	....	1	....	1	1	1	....
Chloride	1-2	....	1	....	1-2	1	1	....
Chloride, Barium Free	....	....	....	....	1*	1	1	....
Hydroxide	1-3	....	....	....	2	1	1	....
Iodide	....	....	....	....	2	....	1	....
Nitrate	1-2-3	....	1	....	1-2	1	1	....
Sulphate	1-2	....	1	....	2	1-2	1	....
Strophanthin	....	....	....	....	2	....	....	....
Strychnine	....	....	....	....	2	....	....	....
Sucrose, Cryst	1	....	....	....	1*-1-2	....	1	....
Sugars, Rare	....	....	....	....	2	....	....	....
Sulphur, Precip	2	....	2	....	2	2	1	....
Chloride	1	....	2	....	2	....	1	....
Dioxide (Anhyd.)	1	....	1	3	....	....	1	....
Iodide	....	....	....	....	....	....	1	....
Superolol	....	....	....	....	1*-1	....	....	....
Tartar Emetic	2-3	....	....	....	2	1	1	....
Terpin Hydrate	2	1	....	....	2	2	....	....
Terpineol	....	1	....	....	2	1	....	....
Test Papers	....	....	1	....	....	1	1	....
Tetraiodofluorescein	....	1	....	....	2	....	....	....
Theobromine	....	1	....	....	2	....	....	....
Thorium Salts	....	....	....	....	....	....	1	....
Thymol	2	1	....	....	1*-2	....	....	....
Blue	....	1	....	....	....	....	....	....
Iodide	2	....	....	....	2	....	....	....
Phthalein	....	1	....	....	....	....	....	....
Tin (Metal), Mossy, Sticks & 20-30 Mesh	1	....	1	....	1-2	....	1	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Tin Bichloride	1–3	....	1–3	3	1*–2	1	1	....
Chloride	....	....	1–2	3	1*–1–2	1	1	....
Oxide	....	....	....	3	1–2	1	1	....
Toluene	1–2	1–2	2	....	1–2	1	1	....
Tungsten & Salts	....	....	....	....	....	1	1	....
Uranium Acetate Na. Free	1–2	....	....	....	1*	1	1	....
Acetate	1	....	....	....	1	1	1	....
Nitrate	1–2	....	1	....	1	1	1	....
Nitrate, Fr. Fr. Alkali Salts	1	....	....	....	1*	1	1	....
Salts	....	....	....	....	....	1	1	....
Urea	1–2	1	....	....	1–2	1	....	....
Vaccines	....	....	....	....	....	....	....	....
Vanillin	....	1	....	....	2	1	....	....
Veratrine & Its Salts	....	....	....	....	2	2	....	....
Volumetric Solutions	....	....	1	....	2	1	1	....
Whiting	....	....	....	....	2	....	....	....
Xylene	1–2	1	2	....	1–2	1	1	....
Zinc Metal	1–2	....	1	....	1*–1–2–3	....	1	....
Metal, As. Free, Mossy-shot-sticks 10–20 mesh	1	....	1	....	1*	....	1	....
Metal, Mossy,—shot sticks po. 10–20	1–2	....	1–2	....	1*–1	....	1	....
Acetate	1–2	....	....	....	1–2	1–2	1	....
Bromide	1–2	....	....	....	2	....	1	....
Carbonate	1–2	....	1	....	1–2	1–3	1	....
Chloride, Gran	1–2–3	....	1	3	1*–1–2	1	1	....
Chloride, Sticks	1–2	....	1	....	1–2	1	1	....
Cyanide	....	....	....	....	....	....	1	....
Iodide	....	....	....	....	2	....	1	....
Nitrate, Cryst	1–2	....	1	....	1–2	1	1	....
Oxalate	1	....	....	....	2	1	1	....
Oxide, Wet Proc	1	....	....	....	1*–1–2	1	1	....
Stearate	2	....	....	....	2	2	1	....
Sulphate, Cryst	1–3	....	1	3	1*–1–2	1–2–3	1	....
Sulphate, Po	1	....	....	....	1–2	1–2–3	1	....
Sulphide	1	....	....	....	2	1	1	....

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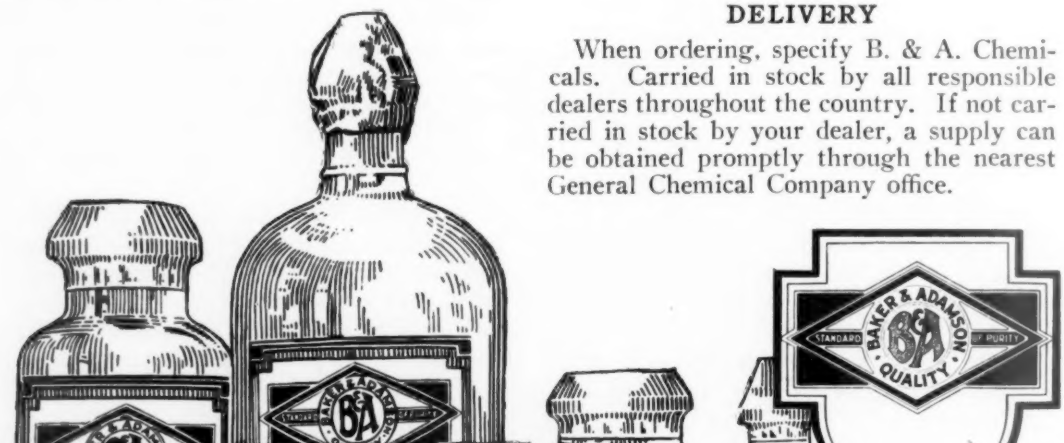

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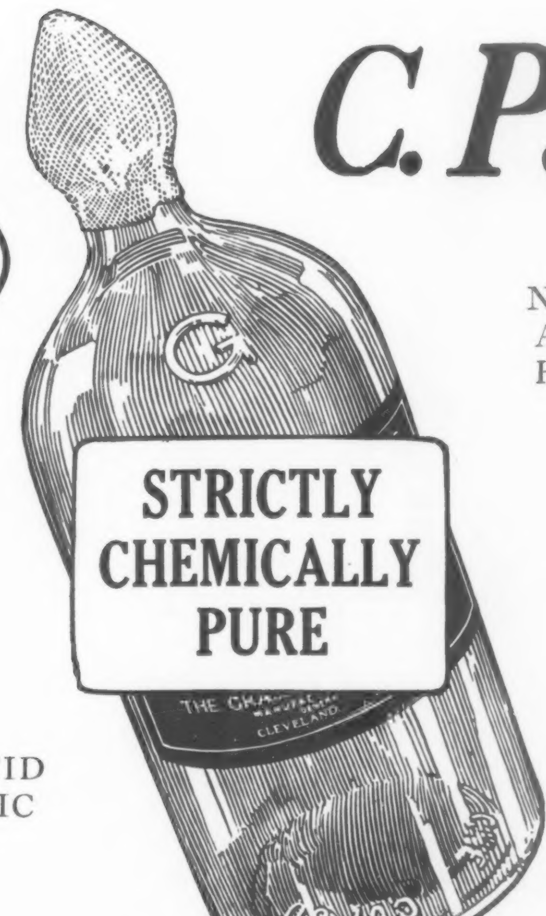

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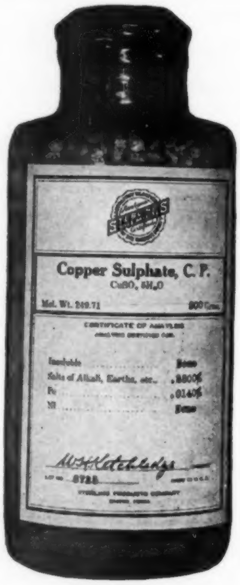

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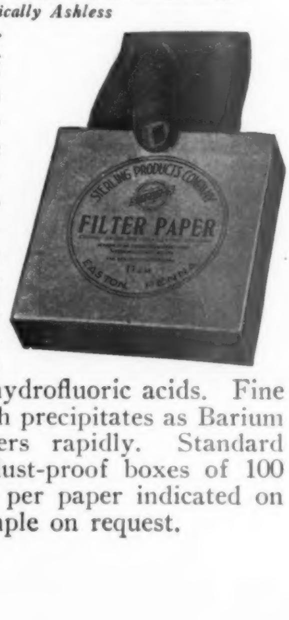

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Section XI

ARCHITECTS
FOR EDUCATIONAL BUILDINGS

The following directory is restricted to architects who, during the last five or six years, have designed three or more school or college buildings costing over $50,000 each.

Many of these architects have, of course, handled during this period a much larger amount of work in the educational field than that shown. Space limitations, however, have necessitated the restricting of each architect to three listings, and the buildings mentioned are regarded as typical examples of the architects' recent work.

No attempt has been made to evaluate the skill or professional standing of the architects listed. Boards of Education and persons interested in the construction of new buildings can obtain valuable advice in this matter from the presidents of the local chapters of the American Institute of Architects, or from the national headquarters of that organization, The Octagon, Washington, D. C., or from such sources as the United States Bureau of Education, the respective state departments of education, the Bureau of Education of the National Catholic Welfare Conference, or the Department of Educational Administration of Teachers College, Columbia University, New York.

The 48 states are arranged in alphabetical order, followed by the Canadian provinces in alphabetical order. Under each state heading and province the sequence is not by cities, but by architects' names for the entire state or province in alphabetical order.

ALABAMA

Fredrick Ausfeld, Montgomery
Sidney Lanier High School, Montgomery
Gymnasium Building, Montgomery
Goode Street Grammar School, Montgomery

Denham & Denham, Birmingham
Fairfield High School, Fairfield
Fairfield Junior High School, Fairfield
Ensley-Howard High School, Ensley (affiliated with Howard College, Birmingham)

Hirsch & Jones, Montgomery
Dothan Elementary School, Dothan
Bonifay Elementary School, Bonifay, Fla.
Chipley Elementary School, Chipley, Fla.

Miller & Martin, Architects; **J. A. Lewis,** Engineer, Birmingham
Group of seven buildings for the University of Alabama, Tuscaloosa
Group of four buildings for Birmingham-Southern College, Birmingham
Three school buildings for Board of Education, Birmingham

Bem Price, Birmingham
Tupelo High School, Tupelo, Miss.
Minor High School, Jefferson County
Dormitory, Athens College, Athens

W. A. Rayfield, Birmingham
Unity College, Muskogee, Okla.
Hudson Public School, Birmingham
Guadalupe College Buildings, Seguin, Texas

A. Duncan Simpson, Gadsden
Gadsden High School, Gadsden
Etowah Grammar School, Gadsden
East Gadsden Grammar School, Gadsden

Warren, Knight & Davis, Birmingham
Erskine Ramsay Engineering Building, Alabama Polytechnic Institute, Auburn
Chemistry Building, University of Alabama, Tuscaloosa
New group of buildings, Alabama College, Montevallo

Wm. Leslie Welton, Birmingham
Athenaeum, Parochial School, Birmingham
Robinson School, Birmingham
Gorgas School, Birmingham

ARIZONA

Fitzhugh & Byron, Phoenix
Phoenix Junior College, Phoenix
Clarkdale High School, Clarkdale
Phoenix Union High School (colored), Phoenix

Lescher & Mahoney, Phoenix
Stadium, Phoenix Union High School, Phoenix
St. Mary's Parochial Grade School, Phoenix
Jerome High School, Jerome

Roy Place, Tucson
University of Arizona Group, Tucson
High School, Tucson
State School for the Deaf and Blind Group, Tucson

V. O. Wallingford, Phoenix
James Russell Lowell School, Phoenix
Emerson Primary School, Phoenix
Flagstaff High School, Flagstaff

ARKANSAS

John P. Almand, Little Rock
Bentonville High School, Bentonville
Morrilton High School, Morrilton
Russellville Junior and Senior High School, Russellville

James Dinwiddie, Fayetteville
Washington Grade School, Springdale, and Westside School, Fayetteville
High School with Annexes, Fayetteville
Junior-Senior High School, Springdale

George R. Mann, Wanger & King, Little Rock
North Little Rock High School, North Little Rock
Hickory Street School, North Little Rock
County School Buildings, Pulaski County

CALIFORNIA

Allison & Allison, Los Angeles
Myrtle Avenue Elementary School, Monrovia
Roosevelt Elementary School, Colton
Auditorium and classroom building, University of California, Los Angeles

Bakewell & Brown, San Francisco
Loeb Marine Laboratory, Stanford University, Pacific Grove
New group of dormitory buildings, Stanford University, Palo Alto
Douglas Everett Grammar School, San Francisco

Richard M. Bates, Jr., Los Angeles
La Ballona Junior High School, Culver City
South Whittier Junior High School, Whittier
Azusa City Schools, Azusa

Edwin Bergstrom, Los Angeles
Auditorium and Administration Building, John C. Freeman High School, Los Angeles
Science and Shop Buildings, same
Boys' and Girls' Gymnasium Buildings, same

Charles H. Biggar, Bakersfield
Kern County Union High School Group
Lincoln School, Bakersfield
Standard School, Oildale

Leon Caryl Brockway, Pasadena
Jefferson Primary School, Pasadena
Jefferson Elementary School, Pasadena
Arroyo Seco School, Pasadena

A. A. Cantin, San Francisco
Martin Junior College, Kentfield
Alhambra High School, Alhambra
Dos Palos High School, Dos Palos

Orville L. Clark, Los Angeles
Kern County Union High School, Bakersfield
Paso Robles Union High School, Paso Robles
Russell Elementary School, Los Angeles

W. D. Coates, Jr., Co.
Hanford Union High School, Hanford
Porterville Union High School, Porterville
Sanger Union High School, Sanger

Norman R. Coulter, San Francisco
Monterey Union High School, Monterey
Central Elementary School, Sausalito
Del Norte County Union High School, Crescent City

Louis N. Crawford, Santa Maria
Orcutt Union School
Toleta Union School
San Luis Obispo School (T. C. Kistner & Co., Associate Architects)

Davis-Pearce Co., Stockton
The College of the Pacific, Stockton
Marysville Union High School, Marysville
Manteca Union High School, Manteca

John J. Donovan, Oakland
St. Mary's College Group, Moraga
Eureka Junior High School, Eureka
Clawson Elementary School, Oakland

Frederick H. Eley, Santa Ana
Julia Lathrop Junior High School, Santa Ana
Roosevelt Grade School, Santa Ana
Gymnasium, High School, Santa Ana

Rudolph Falkenrath, Jr., Los Angeles
Norma Gould School of the Dance, Los Angeles
Wonderland Avenue School, Los Angeles
102nd Street School, Los Angeles

Franklin T. Georgeson, Eureka
Arcata Union High School, Arcata
Fortuna Union High School, Fortuna
Ferndale Grammar School, Ferndale

Frank M. Goodwin, Compton
Beryle Heights Grammar School, Redonda Beach
Compton Union High School Gymnasium, Compton
Watts High School, Watts

Elmer Grey, Pasadena
Custer Avenue School, Los Angeles
Euclid Avenue School, Los Angeles
Pasadena Community Playhouse (Dramatic School), Pasadena

J. de Forest Griffin, Los Angeles
Chehalis Junior High School, Chehalis, Wash.
Bellarmine Jesuit College Group, Tacoma, Wash.
St. Mary's Academy, Cowlitz, Wash.

Myron Hunt & H. C. Chambers, Los Angeles
Library, Orr Hall, and Erdman Hall (women's dormitories), Occidental College, Eagle Rock, Los Angeles
Lankershim High School, Los Angeles
Whittier Union High School Group, Whittier

Jeffery & Schaefer, Los Angeles
Franklin High School, Los Angeles
Montebello High School, Montebello
Banning Union High School, Banning

Clarence A. Kelso, Los Angeles
Abraham Lincoln Elementary School, Lynwood
Chas. A. Lindbergh Elementary School, Lynwood
Davis Elementary School, Duarte

T. C. Kistner & Co., Los Angeles (also San Diego)
Excelsior Union High School Group, Norwalk
Theodore Roosevelt Junior High School, San Diego
Brea-Olinda Union High School, Brea

Norman F. Marsh & Co., Los Angeles
Physical Education Building, University of Redlands, Redlands
Junior High School, South Pasadena
Hollywood High School Auditorium, Los Angeles

Mott M. Marston, Los Angeles
Tustin Union High School Buildings, Tustin
May Henning School, Ventura
Selma Avenue School, Los Angeles

Marston, Van Pelt & Maybury, Pasadena
Andrew Jackson Grammar School, Pasadena
Longfellow Grammar School, Pasadena
Central Junior High School, Riverside

Albert C. Martin, Los Angeles
Conaty Memorial High School, Los Angeles
Lomita High School of Los Angeles group
Polytechnic High School (two buildings), Los Angeles

Mayo, Bissell & Co., Stockton
Auditorium and Conservatory Building, College of the Pacific, Stockton
New group of buildings, Calaveras Union High School, San Andreas

Henry H. Meyers, San Francisco
Washington Union High School, Centerville
Grade School, Alvarado
Grade School, Decoto

Miller & Pflueger, San Francisco
Jefferson Elementary School, San Francisco
Alamo Elementary School, San Francisco
Roosevelt Junior High School, San Francisco

DeWitt Mitcham, San Bernardino
Thomas Jefferson Elementary School, San Bernardino
St. Elmo Elementary School, San Bernardino
San Bernardino Valley Junior College Gymnasium, San Bernardino

Morgan, Walls & Clements, Los Angeles
Rosemead Grammar School, Rosemead
Auditorium Unit, Polytechnic High School, Los Angeles
Theatre Unit, Egan School of Dramatic Art, Los Angeles

Karl W. Muck, County Architect, Los Angeles
Juvenile Hall School (for delinquent minors), Los Angeles
El Retiro School (Girls' Rehabilitation School), San Fernando
Occupational Therapy School (for consumptive children), Olive View

James T. Narbett, Richmond
Roosevelt Junior High School, Richmond
Fairmont Grade School, Richmond
Woodrow Wilson Grade School, Richmond

A. S. Nibecker, Jr., South Pasadena
Richard Henry Dana Junior High School, San Pedro
Victory Boulevard Elementary School, Lankershim
Dorris Place Elementary School, Los Angeles

E. L. Norberg & John E. Norberg, San Francisco
San Mateo High School Group, San Mateo
Grand Avenue Grammar School, South San Francisco
High School Gymnasium, Burlingame

Paul C. Pape, Los Angeles
Physical Training Building, Hollywood High School, Los Angeles
97th Street Elementary School (original building), Los Angeles
97th Street Elementary School (second building), Los Angeles

J. A. Porporato, San Francisco
Fairfax School, Fairfax, Marin County
Salesian House of Studies Group, Richmond, Contra Costa County

W. H. Ratcliff, Jr., Berkeley
New group of buildings, Mills College, Oakland (also, general schème for future development)
New group of buildings, Pacific School of Religion (also, general scheme for future development)
Hillside School, Berkeley

Alfred W. Rea & Chas. E. Garstang, Los Angeles
New group of buildings, El Segundo High School, El Segundo
Administration and Auditorium Building, Compton Union High School, Compton
Chemawa Junior High School, Riverside

Reed & Corlett, Architects and Engineers, Oakland
Chabat Grammar School, Oakland
Dixon Grammar School, Dixon
Oakland High School, Oakland

M. P. Renfro, San Bernardino
San Bernardino Valley Junior College Gymnasium, San Bernardino
Thomas Jefferson Grammar School, San Bernardino
San Bernardino Junior High School Gymnasium, San Bernardino

Requa & Jackson, San Diego
McKinley Grammar School, San Diego
St. Augustine Boys' High School, San Diego
Montezuma Mountain School for Boys, Los Gatos

A. F. Rosenheim, Los Angeles
Remodeling of Hollenbeck Heights Junior High School, Los Angeles
Girls' Gymnasium and Open-Air Lunching Pavilion, same
42nd Street School, Los Angeles

Allen Ruoff, Los Angeles
Wilshire Branch Library, Los Angeles
Vernon Avenue School, Los Angeles
Sierra Vista School, Los Angeles

Howard Schroder, Oakland
Lowell Junior High School, Oakland
Morris B. Cox Elementary School, Oakland
Prescott Domestic Science Unit, Oakland

George C. Sellon & Co., Sacramento
Yuba City Union High School, Yuba City
Colusa Union High School, Colusa
Loomis Union Grammar School, Loomis

Shields, Fisher & Lake, Fresno
Roosevelt High School, Fresno
Lincoln Grammar School, Taft
Benjamin Franklin School, Fresno

Horace G. Simpson, San Francisco
Sacramento High School and Junior College, Sacramento (Edgar A. Mathews, Associate Architect)
Grass Valley High School, Grass Valley (William Mooser, Associate Architect)
Church School (First Congregational Church), Berkeley

Soule, Murphy & Hastings, Santa Barbara
Roosevelt Elementary School, Santa Barbara
Harding Elementary School, Santa Barbara
Frederick Forrest Peabody Elementary School, Santa Barbara

Fay R. Spangler, Santa Ana
Laguna Grammar School, Laguna Beach
Magnolia Grammar School, Orange County
Yorba Linda Grammar School, Orange County

Swartz & Ryland, Fresno
Grammar School, Tulare
Heaton Elementary School, Fresno
Gymnasium, High School, Coalinga

Symmes & Cullimore, Bakersfield
Beardsley Grammar School, Bakersfield
Shafter High School, Shafter
McFarland High School, McFarland

Edward Cray Taylor & Ellis Wing Taylor, Architects and Engineers, Los Angeles
Cabrillo Avenue Elementary School, San Pedro
Glassel Park Elementary School, Los Angeles
Hooper Avenue Elementary School, Los Angeles

Ralph D. Taylor, Susanville, Lassen County
Roosevelt Elementary School, Susanville, Lassen County
High School Group, Greenville, Plumas County
High School Group, Portola, Plumas County

Walker & Eisen, Los Angeles
Thomas A. Edison Junior High School, Los Angeles
Humphreys Avenue School, Los Angeles
South Park School, Los Angeles

W. H. Weeks, San Francisco
Santa Barbara High School, Santa Barbara
Santa Rosa High School, Santa Rosa
Woodrow Wilson Junior High School, San Jose

G. Stanley Wilson, Riverside
Riverside Junior College, Riverside
Corona High School, Corona
Palm School, Riverside

Carleton Monroe Winslow, Los Angeles
Fullerton Union High School Group, Fullerton
Eagle Rock High School, Los Angeles
Thacher School Library, Ojai

Henry J. Withey, Los Angeles
Fries Avenue Elementary School, Wilmington
Malabar Street Elementary School, Los Angeles
Van Nuys Elementary School, Van Nuys

Ralph Wyckoff, San Jose
Salinas Union High School and Junior College, Salinas
Willow Glen School, Willow Glen
Gilroy High and Elementary Schools, Gilroy

A. C. Zimmerman & A. M. Edelman, Los Angeles
Horace Mann Junior High School, Los Angeles
West Athens School, Los Angeles
52nd Street School, Los Angeles

COLORADO

William N. Bowman Co., Denver
Gymnasium, State Teachers College, Greeley
Cole Junior High School, Denver
High School, Fort Collins

T. H. Buell & Co., Denver
Asbury Elementary School, Denver
Mountair School, Jefferson County
Fruitdale School, Jefferson County

Walter DeMordaunt, Pueblo
Park Hill Junior High School, Pueblo
Pleasant View High School, Pueblo
Hot Springs County High School, Thermopolis, Wyo.

William E. & Arthur A. Fisher, Denver
South High School, Denver
Morey Junior High School, Denver
Barnes Commercial School, Denver

Eugene G. Groves, Denver
Library, Colorado Agricultural College, Fort Collins
High School, Canon City
Fairview Grade School, Denver

Henry James Manning, Denver
Residence Hall, Regis College, Denver
Fairmont Grade School, Denver
Washington Park Grade School, Denver

Marean & Norton, Denver
Globeville Grade School, Denver
Phi Rho Sigma Fraternity House, University of Colorado Medical School, Denver
Washington Park Grade School, Denver

I. H. & W. M. Rapp Co., Trinidad
Willson Hall—Science Building for New Mexico Military Institute, Roswell, N. Mex.
Cahoon Armory for New Mexico Military Institute, Roswell, N. Mex.
St. Mary's Parochial School, Walsenburg

E. Floyd Redding, Denver
Opportunity School (Vocational High School), Denver
High School, Nogales, Ariz.
High School, Casper, Wyo.

Walter H. Simon, Denver
Lakewood Grade School, Denver
Englewood Grade Schools (two), Englewood
Kappa Sigma Fraternity House, University of Denver, Denver

Geo. H. Williamson, Denver
East Senior High School, Denver
Wm. H. Smiley Junior High School, Denver
Henry M. Teller Grade School, Denver

CONNECTICUT

Leonard Asheim, Bridgeport
Junior High School, Bridgeport
Roosevelt School (City Normal), Bridgeport
Whittier School, Bridgeport

Fred'k H. Beckwith, Bridgeport
Warren Harding High School, Bridgeport (Associated with Caldwall, Walker & Beckwith)
Nichols School, Stratford
Wilcoxson Avenue School, Stratford

Walter P. Crabtree & Son., Hartford
Lincoln Elementary School, New Britain
Federal Hill Elementary School, Bristol
Vocational High School, New Britain

A. Graham Creighton, New London
Hand Academy, Madison
Charles B. Jennings Grammar School, New London
Rutland High School, Rutland, Vt.

R. W. Foote, New Haven
West Haven High School, West Haven
Branford High School, Branford
Silsbey Science Hall, Talladega, Ala.

George H. Gray, New Haven
Berea College, Berea, Ky.
South Campus: Rogers Hall (Girls' Dormitory); Woods-Penniman Building (Women's Union)
North Campus: Emery Building (Domestic Science); Science Hall; Seabury Gymnasium for Men
East Campus: Agricultural Building

William E. Hunt, Torrington
Central Grade School, Winsted
Greenwood School, Winsted
Wetmore School, Torrington

Wm. D. Johnson, Hartford
Seymour High School, Seymour
Francis Stillman Grammar School, Wethersfield
Holcomb Street Grammar School, Hartford

William T. Marchant, Hartford
High School, West Hartford
Junior High School, West Hartford
Grade School, East Hartford

Mylchreest & Reynolds, Hartford
Washington Street School Addition, Hartford
Our Lady of Sorrows Grammar School, Hartford
Dormitory, Westminster School, Simsbury

Delbert K. Perry & Earle K. Bishop, New Britain
Group of buildings, Connecticut Agricultural College, Storrs
Junior High School, Newington
Washington Elementary School, New Britain

Wm. Thomas Towner, Middletown
Farmington High School, Farmington
Calvin Coolidge Junior High School, Shrewsbury, Mass.
Samuel Huntington School, Norwich

Max J. Unkelbach, New Britain
Nathan Hale Junior High School Annex, New Britain
Vocational High School (State Trade School), New Britain
Israel Putnam School, New Britain

Whiton & McMahon, Hartford
Alfred E. Burr School, Hartford
Richard J. Kinsella School, Hartford
James H. Naylor School, Hartford

DISTRICT OF COLUMBIA

Albert I. Cassell, Washington
Howard University group, Washington
College of Medicine
Gymnasium, Armory and Stadium
Home Economics Building

Milburn-Heister & Co., Washington
Junior High School, Durham, N. C.
School of the Blessed Sacrament, Washington
Fayetteville High School, Fayetteville, N. C.

Rossel Edw. Mitchell, Washington
Methodist Protestant College, High Point, N. C.
High School, Bethesda, Md.
Grade School, Falls Church, Va.

Upman & Adams, Washington
Washington-Lee High School, Ballston, Arlington County, Va.
George Mason High School, Del Ray, Arlington County, Va.
Lucretia Mott Grade School, Washington

FLORIDA

Franklin O. Adams, Tampa
Plant High School, Tampa
Henry B. Mitchell Graded School, Tampa
Thonotosassa Graded School, Thonotosassa

T. M. Bryan, Architect and Acoustical Engineer, Sarasota
Dormitory No. 1, Florida Industrial School for Girls, Ocala
Golf Street Primary School, Sarasota
Nokomis Junior High School, Nokomis

Carpenter & Bent, De Land
Senior and Junior High School, New Smyrna
Seabreeze Elementary School, Daytona Beach
Volusia Avenue Grade School, Daytona Beach

W. M. Christen, Melbourne
High School, Melbourne
Primary School, Melbourne
Elementary School, Melbourne

Frank Dunham, Tampa
N. P. Broward School, Tampa
Oak Park School, Tampa
Federated and Musicale Auditorium, Tampa

M. Leo Elliott, Inc., Tampa
Sarasota Senior High School, Sarasota
Dade City Grammar School, Dade City
Orange Grove Elementary School, Tampa

Edward D. Fitchner, Tallahassee
St. Andrews Grade School, St. Andrews
Bay County High School, Panama City
Jackson County High School, Marianna

C. Frank Galliher, Tampa
Ballast Point Junior High School, Ballast Point
West Shore Junior High School, Port Tampa
Desota Park Grammar School, Tampa

August Geiger, Miami
Shenandoah Junior High School, Miami
Robert E. Lee Auditorium, Miami
Montmare School, Miami Beach

Mellen C. Greeley, Jacksonville
John Gorrie and Edmund Kirby Smith Junior High School Annex buildings, Jacksonville
Madison High School, Madison
Greenville High School, Greenville

Harry M. Griffin, Daytona Beach
Junior-Senior High School, Daytona Beach
Junior-Senior High School, Leesburg
Junior-Senior High School, Titusville

Bert D. Keck, Stuart
Stuart High and Grade School, Stuart
Indiantown Grade School, Indiantown
High and Junior High School, East Grand Forks, Minn.

Francis J. Kennard & Son, Tampa
Hillsborough High School, Tampa
Memorial Junior High School, Tampa
West Tampa Junior High School, Tampa

Kiehnel & Elliott, Miami
Miami Senior High School, Miami
Group of buildings, Coral Gables Elementary School, Coral Gables
Greenfield Elementary School, Pittsburgh, Pa.

Maurice E. Kressly, Orlando
Greensburg Junior-Senior High School, Greensburg, Pa.
Lincoln High School, Ridgeway, Pa.
St. James' Roman Catholic Parish School, Orlando

H. G. Little Associates, Wauchula
Zolfo Springs High School Group, Zolfo Springs
Fort Meade High School Group, Fort Meade
Wauchula High School, Wauchula

Mark & Sheftall, Jacksonville
Robert E. Lee and Andrew Jackson High Schools, Jacksonville
High and Grade School, Crescent City, Putnam County
Elementary School, Palatka, Putnam County

Elton J. Moughton, Sanford
Seminole High School, Sanford
South Side Primary School, Sanford
Crooms Academy (Negro School), Sanford

H. Hastings Mundy, Miami
Ada Merritt Junior High School, Miami
Robert E. Lee Junior High School, Miami
Dade County Agricultural Senior High School, Miami

Howard M. Reynolds, Orlando
Group of three buildings, Orlando Senior High School, Orlando
Group of two buildings, Orlando Junior High School No. 1, Orlando
Group of four buildings, Winter Park Junior-Senior High School, Winter Park

E. L. Robertson & L. R. Patterson, Miami
Auditorium and Cafeteria, Riverside School, Miami
Auditorium and Cafeteria, Highland Park School, Miami
Miami Shores School, Miami

Henry L. Taylor, St. Petersburg
South Side Junior High School, St. Petersburg
Lakeview Avenue Grade School, St. Petersburg
Grade School for Colored Children, St. Petersburg

Rudolph Weaver, Gainesville
Administration Building, Agricultural and Mechanical College, Tallahassee
Chemistry-Pharmacy Building, University of Florida, Gainesville
Horticultural Building, University of Florida, Gainesville

S. J. Welch, Pensacola
Jasper High School, Jasper
Milton Grammar School, Milton
Bonifay High School, Bonifay

Henry P. Whitworth, Lakeland
Polk City Grammar School, Polk City
Webster Avenue School, Lakeland
John F. Cox Grammar School, Lakeland

Frank A. Winn, Jr., Tampa
Benjamin Franklin Junior High School, Tampa
Wimauma Elementary-High School, Wimauma
John T. Kenley Elementary School, Uceta

GEORGIA

Edward F. Billie, Atlanta
High School, Anniston, Ala.
Auditorium and Gymnasium Wing, Alabama Military Institute, Anniston, Ala.
High School, Live Oak, Fla.

Harold Bush-Brown & J. H. Gailey, Atlanta
Julius Brown Memorial Hall (dormitory), Georgia School of Technology, Atlanta
N. E. Harris Hall (dormitory), same
Dining Hall, same

Daniell & Beutell, Atlanta
William A. Russell High School, Fulton County, Atlanta
Marietta High School, Marietta
English Avenue School, Atlanta

Dunwody & Oliphant, Macon
Bruce Grammar School, Macon
Law Building, Mercer University, Macon
New group of buildings, Wesleyan College, Macon (Walker & Weeks, Associate Architects)

Edwards & Sayward, Atlanta
Training School, Winthrop College, Rock Hill, S. C.
Columbia Theological Seminary, Atlanta
Girls Senior High School, Atlanta

Greer & Biggers, Valdosta
Midville Consolidated School, Midville
Jesup High School, Jesup
Lakeland High School, Lakeland

Hentz, Adler & Shutze, Atlanta
Fulton County High School, Atlanta
School of Commerce and Journalism Building, University of Georgia, Athens
Science Building, Spelman College, Atlanta

Chas. H. Hopson, Atlanta
Clark University, Atlanta
Gammon Theological Seminary, Atlanta
Joel Chandler Harris Grammar School, Atlanta

Willis Irvin, Augusta
Additions and alterations, Girls High School, Augusta
Allendale Centralized School, Allendale, S. C.
William Robinson School, Augusta

Ivey & Crook, Atlanta
Chemistry Building, Emory University, Atlanta
Valdosta Junior College for Men, Valdosta
Druid Hills District School (High and Primary), Decatur

Levy & Clarke, Savannah
Bryan County High School, Pembroke
Annex, Waters Avenue School, Savannah
East Side Baldwin Kindergarten, Savannah

T. F. Lockwood, Columbus
Central High School, Phenix City, Ala.
Vocational Building, Industrial High School, Columbus
Group of three buildings, Fitzgerald

Morgan, Dillon & Lewis, Atlanta
Administration Building, Oglethorpe University, Atlanta
Founders Tower Group, same
Lupton and Lowry Halls, same

G. Lloyd Preacher & Co., Inc., Atlanta
Tubman High School for Girls, Augusta
Lanier High School for Boys, Macon
Evans High School, Spartanburg, S. C.

Scroggs & Ewing, Augusta
Academy of Richmond County and Junior College, Augusta
Monte Sano Grammar School, Augusta

Matthews H. Tardy, Macon (Formerly of L. P. Smithey & Tardy, Roanoke, Va.)
Roanoke Senior High School, Roanoke, Va.
Roanoke Junior High School, Roanoke, Va.
Consolidated School, Rockymount, Va.

Thole & Legeman, Atlanta
Assumption Parochial School, Eville
Emma Roach Elementary School, Eville
Howard Roosa Elementary School, Eville

Wallin & Comer, Savannah
Memorial High School and Auditorium, Savannah
Science Building, Georgia State Agriculture School
Cuyler Street School, Savannah

HAWAII

L. E. Davis, Architect; **Ralph A. Fishbourne,** Associate Architect, Honolulu
Large group of buildings, New McKinley High School project, Honolulu

C. W. Dickey, Honolulu
Roosevelt High School, Oakland, Calif.
University High School, Oakland, Calif.
New group of buildings, Kamehameha School, Honolulu (Associate Architect)

IDAHO

Wayland & Fennell, Boise
Administration and Library Building, Pocatello
Administration and Library Building, Albion State Normal School, Albion
High School, Payette

ILLINOIS

Ralph E. Abell Co., Chicago
Palatine Township High School, Palatine
McHenry Community High School, McHenry
Arlington Heights Township High School, Arlington Heights

Aldrich & Aldrich, Galesburg
Alexis Community High School, Alexis
Cooke Grade School, Galesburg
Fairview High School, Fairview

Ashby, Ashby & Schulze, Chicago
J. Sterling Morton High School, Cicero
Leyden Community High School, Franklin Park
John Mills School, Elmwood Park

Bradley & Bradley, Rockford
John W. Henney Grade School, Freeport
Community High School, South Beloit, Wis.
Community High School, Stillman Valley

Herbert A. Brand, Chicago
St. Paul's Evangelical Lutheran School, Indianapolis, Ind.
Dormitory, Evangelical Theological Seminary, Naperville
Gymnasium, Concordia Teachers College, River Forest

Brooks, Bramhall & Dague, Decatur
Roosevelt Junior High School, Decatur
Southeast Junior High School, Decatur
Washington Grade School, Decatur

Cervin & Stuhr, Rock Island
High School, Prophetstown
High School and Grade School, Hanover
Stadium, High School, Rock Island

Childs & Smith, Chicago
Haven Intermediate School, Evanston
Jackson High School, Jackson, Mich.
Horace Mann Elementary School, Oak Park

John D. Chubb, Chicago
Central Senior High School, Power Plant, and Elementary Schools, Kenosha, Wis.
Southeastern Junior High School, Battle Creek, Mich.
Maine Township High School, Cook County

Edwin H. Clark, Inc., Chicago
Chicago Latin School, Chicago
Group of buildings, North Shore Country Day School, Winnetka
Group of buildings, Glenwood Manual Training School, Glenwood

S. A. Clausen, Decatur
Mt. Zion Community High School, Mt. Zion
Niantic Community High School, Niantic
Mt. Auburn Community High School, Mt. Auburn

Coolidge & Hodgdon, Chicago
Group of seven buildings, University of Chicago, Chicago
Group of three buildings, St. Olaf College, Northfield, Minn.
Glenbard High School, Glen Ellyn

S. Lester Daly, Metropolis
Herrin Grade School, Herrin
Christopher Community High School, Christopher
Carterville Community High School, Carterville

Doerr & Doerr, Chicago
Whittier Grade School, Blue Island
Loretto Academy, Chicago
Evergreen Park Grade School, Evergreen Park

Hamilton B. Dox, Peoria
City High School, Bushnell
Community High School, Manito
St. Mark's Parochial School, Peoria

N. Max Dunning, Architect; **Van Gunten & Van Gunten,** Associate Architects, Chicago
R. L. Stevenson School, Melrose Park
Garfield School, Maywood
Lincoln School, Maywood

A. B. Frankel, East St. Louis
Hawthorne Elementary School, East St. Louis
Woodrow Wilson Elementary School, East St. Louis
Junior High School, Litchfield

Hermann J. Gaul & Son, Chicago
St. Michael's High School, Chicago
Sacred Heart Elementary School, Chicago
St. Benedict's Elementary School, Chicago

Gill & Jackson, Murphysboro (also St. Louis, Mo.)
Du Quoin Township High School, Du Quoin
Rebuilding—Murphysboro Township High School, Murphysboro
Logan Junior High School, Murphysboro

Granger & Bollenbacher, Chicago
Women's Memorial Residence Hall, Indiana University, Bloomington, Ind.
Pierce Hall (Men's Union Building), Kenyon College, Gambier, Ohio
Northwestern University Group, Evanston
14 Sorority Buildings
2 Dormitories (with James Gamble Rogers)

Hamilton, Fellows & Wilkinson, Chicago
Evanston Township High School, Evanston
Capital University, Columbus, Ohio
Skokie School, Winnetka

Helmle & Helmle, Springfield
Feitshans School, Springfield
Pana Township High School, Pana
St. Mary's Academy, Salt Lake City, Utah

Hewitt, Emerson & Gregg, Peoria
Three Elementary Schools, Aurora
Grade School and High School, Carlinville
Elementary School, Jacksonville

Holmes & Flinn, Chicago
James Russell Lowell School, Oak Park
Carleton College Group, Northfield, Minn.
The McKinley Foundation at the University of Illinois, Champaign

J. W. Kennedy, East St. Louis
Collinsville Township High School, Collinsville
Dupo Community High School, Dupo
Freeberg Community High School, Freeberg

Lewis & Dougherty, Chicago
Danville High School, Danville
West Chicago High School, West Chicago
J. H. Freeman Grade School, Aurora

Liese & Ludwick, Danville
Mayo Junior High School, Paris
Community High School, St. Joseph
Community High School, Tuscola

Jos. C. Llewellyn Co., Chicago
Lyons Township High School, La Grange
Elementary School (platoon system), Aurora, Ill.
York Community High School, Elmhurst

Benj. Franklin Olson, Chicago
Rearrangement of campus layout, Elmhurst College, Elmhurst
Group of twelve new buildings and Entrance Gateway, same
Gymnasium and Natatorium Building, same

Oman & Lilienthal, Chicago
School and Parish House, German Evangelical Lutheran Congregation, Chicago
Sigma Delta Tau Sorority House, University of Illinois, Urbana
Sigma Alpha Mu Fraternity House, University of Illinois, Champaign

Edgar A. Payne, Carthage
Consolidated School, Winnebago
Community High School, Durand
Grade and High School, Paw Paw

Perkins, Chatten & Hammond, Chicago
Senior High School, Port Smith, Ark.
Three Elementary Schools, Park Ridge
North Elementary School, River Forest

Peterson & Johnson, Rockford
Theodore Roosevelt Junior High School, Rockford
Abraham Lincoln Junior High School, Rockford
Marengo Community High School, Marengo

L. Pfeiffenberger's Sons, Alton
Clara Barton School, Alton
Marquette High School, Alton
Lincoln School, East Alton

Pond, Pond, Martin & Lloyd, Chicago
Roger Sullivan Junior High School, Chicago
Clinical Hospital Group, University of Illinois, Chicago
Michigan Union Building, Ann Arbor, Mich.

James B. Rezny & Adrian Rezny, Chicago
St. Marie of Celle Elementary School, Berwyn
Our Lady of the Mount Elementary School, Cicero
St. Michael Archangel Elementary School, Chicago

Herbert Hugh Riddle, Chicago
Dormitory, Chicago Theological Seminary, Chicago
Hilton Chapel, same
Library and Taylor Hall, same

Monroe R. Sandel & Co., Chicago
St. Michael's Parochial School, Chicago
St. Hyacinth's Parochial School, Chicago
St. Casimir's Parochial School, Chicago

Schmidt, Garden & Erikson, Chicago
Laboratory and Library, Medical School, University of Illinois, Chicago
College of Pharmacy, University of Illinois, Chicago
Nurses Training School, Michael Reese Hospital, Chicago

N. S. Spencer & Son, Chicago
North and South Intermediate High Schools, Saginaw, Mich.
Junior High School, Whiting, Ind.
Junior High School, Independence, Kans.

Leo Strelka, Chicago
St. Hilary's Elementary School, Chicago
St. Eulalia's Elementary School, Maywood
St. Bronislava's Elementary School, Chicago

Leonard F. W. Stuebe, Danvillé
City High School, Kankakee
Tilton Grade School, Danville
Grade and Junior High School, Savanna

Zook & McCaughey, Chicago
Maine Township High School, Park Ridge
Mt. Prospect School, Mt. Prospect
St. Paul's Lutheran Evangelical School, Mt. Prospect

INDIANA

Austin & Shambleau, South Bend
James Whitcomb Riley Junior High School, South Bend
The Oliver Junior High and Elementary School, South Bend
James Madison Junior High and Elementary School, South Bend

Addison C. Berry & Co., Hammond
Hammond High School, Hammond
Lincoln Grade School, Hammond
Thornton Fractional Township High School, Calumet City, Ill.

Harry E. Boyle & Co., Evansville
High School, Paoli
Junior High School, Harrisburg, Ill.
High School, Hardinsburg, Ky.

Bradley & Babcock, Architect and Engineer, Fort Wayne
North Webster High and Grade School, North Webster
La Paz High School, La Paz
Bourbon Consolidated School, Bourbon

Everett I. Brown, Fort Wayne
Montpelier Junior High School, Montpelier
P. A. Allen High School, Bluffton
Syracuse High School, Syracuse

Charles H. Byfield, Indianapolis
Grade School No. 76, Indianapolis
Grade School No. 85, Indianapolis
Centre Township Grade School No. 3, Indianapolis

Robert Frost Daggett, Indianapolis
Lucy Rowland Hall (Girls' Dormitory), De Pauw University, Greencastle
School of Commerce Building, Indiana University, Bloomington
Butler University Group, Indianapolis (Thomas Hibben, Associate Architect)

Foltz, Osler & Thompson, Indianapolis
Newcastle High School, Newcastle
Theodore Potter Fresh Air School, Indianapolis
New group of buildings, Rose Polytechnic Institute, Terre Haute

J. W. Gaddis, Vincennes
High School, Oaktown
High School, Sandborn
High School, addition, Edwardsport

George & Zimmerman, Indianapolis
Vocational Building, State Normal School, Terre Haute
Valparaiso University Group, Valparaiso
Dormitories, Athens College for Young Women, Athens, Ala.

Henkel & Hanson, Connersville
Jefferson Township, Boone County, School, Dover
Madison High School, Madison
Little Flower School, Indianapolis

Norman H. Hill, Indianapolis
East Columbus Grade School, Columbus
Educational Building, Central Christian Church, Indianapolis
Union Township Consolidated School, Johnson County

O. L. Hill, Bedford
Ellettsville High School, Ellettsville
Needmore High School, Needmore
Fayetteville High School, Fayetteville

Johnson, Miller, Miller & Yeager, Terre Haute
Woodrow Wilson Junior High School, Terre Haute
Girls' Dormitory, Indiana State Normal School, Terre Haute
Gymnasium Building, Indiana State Normal School, Terre Haute

Kervick & Fagan, South Bend
Holy Cross Seminary, Notre Dame
Morrissey Hall, University of Notre Dame, Notre Dame
Lyons Hall, same

McGuire & Shook, Indianapolis
School at Indiana Masonic Home, Franklin
School No. 62, Indianapolis
School, Danville

Karl D. Norris, East Chicago
Roosevelt Junior High School, East Chicago
Lincoln Grade School, Indiana Harbor
La Grange Grade School, La Grange

Wilson B. Parker, Indianapolis
High School, Liberty
Aiken Hall Industrial School, Olive Hill, Ky.
Consolidated School, Kitchel

Wm. Gregory Rammel, Logansport
James Whitcomb Riley Junior High School Group, Logansport
Washington Township Grade and High School, Logansport
Argos High School, Argos

Frank P. Riedel, Lafayette
Highland Grade School, Lafayette
Longlois Grade School, Lafayette
Lincoln Grade School, Lafayette

R. L. Simons, Elkhart
Dormitory, Hanover College, Hanover
Addition to the Goshen Hospital Training School, Goshen
Albion High School, Albion

Robert W. Stevens, Huntington
St. Felix Capuchin Monastery, Huntington
Central Grade School, Huntington
Dallas Township Consolidated School, Andrews

Geo. J. Stoner & Co., Terre Haute
Glenn High School, East Glenn
North Terre Haute High School, North Terre Haute
Concannon High School, West Terre Haute

Sutton & Routt, Vincennes
High School, Lawrenceville
LaSalle School, Vincennes
Vincennes Gymnasium and Coliseum, Vincennes

Charles L. Troutman, Evansville
Carpenter Grade School, Evansville
Benjamin Bosse High School, Evansville
Tell City High School, Tell City

Wainwright, Vaughn & Co., Hammond
Technical High School, Hammond
Lincoln Elementary School, Chicago Heights
Auditorium-Gymnasium, High School, Grovertown

E. R. Watkins, Anderson
The Longfellow School, Anderson
St. Mary's School, Anderson
Anderson High School Gymnasium, Anderson

Werking & Son, Richmond
High School, Hagerstown
High School, Hollansburg, Ohio
High School, Milroy

Joe H. Wildermuth & Co., Gary
Lew Wallace Primary School, Gary
Public Schools Memorial Auditorium, Gary
Tolleston Library, Gary

IOWA

Charles Altfillisch, Decorah
C. K. Preus Gymnasium, Luther College, Decorah
Theta Xi Fraternity House, Iowa City
Gymnasium, High School, Stanton

Beuttler & Arnold, Sioux City
East Senior High School, Sioux City
Girls' Dormitory, Morningside College, Sioux City
High School, Hawarden

Clausen, Kruse & Klein, Davenport
Hayes Elementary School, Davenport
Garfield Elementary School, Davenport
St. Paul's Parochial School, Davenport

Mortimer B. Cleveland, Waterloo
Hawthorne School, Waterloo
Gymnasium, Upper Iowa University, Fayette
Gymnasium, Fletcher College, Oskaloosa

E. O. Damon, Jr., Fort Dodge
St. Mary's School and Convent, Storm Lake
St. Cecilia's School, Algona
Barnum Consolidated School, Barnum

Dougher, Rich & Woodburn, Des Moines
Jefferson Grade School, Muscatine
Senior High School, Marshalltown
Carson Memorial High School, Marengo

Arthur H. Ebeling, Davenport
Maquoketa High School, Maquoketa
Davis Hall, St. Ambrose College, Davenport
St. Joseph's School, Fort Madison

Frank W. Griffith, Fort Dodge
Wahkonsa Grade School, Fort Dodge
Duncombe Grade School, Fort Dodge
Butler Grade School, Fort Dodge

Keffer, Jones & Thomas, Des Moines
Clarinda High School, Clarinda
Mexico High School, Mexico, Mo.
Mediapolis Grade and High School, Mediapolis

Proudfoot, Rawson & Souers, Des Moines
New Medical Group, State University of Iowa, Iowa City
Theodore Roosevelt High School, Des Moines
College buildings, Iowa State College, Ames

Harry E. Reimer, Marshalltown
Garwin High School, Garwin
High School, State Center
High School, Newburg

George A. Spooner, Council Bluffs
Gymnasium, Abraham Lincoln High School, Council Bluffs
Underwood Consolidated School, Underwood
James B. Rue School, Council Bluffs

Thorwald Thorson, Forest City
Lake Mills High School, Lake Mills
Akron High School, Akron
Milford Township Consolidated School, Ames

J. C. Wood Co., Clinton
Grade School, Clinton
High and Grade School, DeWitt
High and Grade School, Preston

KANSAS

W. E. Glover, Topeka, Kans.
Rural High School, Eskridge
High and Grade Schools, Burlingame
High School, Valley Falls

W. E. Hulse & Co., Hutchinson
Junior College, Hutchinson
High School, Minot, N. Dak.
Junior High School, Brookfield, Mo.

Mann & Co., Hutchinson
Senior High School, Dodge City
High School, Bushton
Grade School, Bushton

Routledge & Hertz, Hutchinson
Consolidated School, Winona
Community High School, Leoti
Rural High School, Sylvia

Ralph E. Scamell, Topeka
Benton Hall (Girls' Dormitory), Washburn College, Topeka
Boys' Dormitory, Central College, McPherson
High School, Tonganoxie

Schmidt, Boucher & Overend, Wichita
Administration Building, St. John's College, Winfield
Science Hall, Bethel College, Newton
Group of three buildings, Senior High School, Wichita

Chas. W. Shaver, Salina
High School, Brookville
Bartlett Grade School, Salina
High School, Kanopolis

Smith & English, Hutchinson
Rural High School, Argonia
Rural High School, Oxford
Grade School, La Crosse

Glen H. Thomas, Wichita
Parochial Grade and High School, Andale
Alcott Elementary School, Wichita
New Wichita High School, Wichita

S. S. Voigt, Wichita
High School, Medicine Lodge
Grade School, Caldwell
High School, LeRoy

Thos. W. Williamson & Co., Topeka
High School, Parsons
Science Hall, Baker University, Baldwin
Field House, Washburn College, Topeka

KENTUCKY

H. A. Churchill & John T. Gillig, Lexington
Gymnasium, Kentucky Wesleyan College, Winchester
Dormitory for Girls, Asbury College, Wilmore
Boys' and Girls' Dormitories, Lees Collegiate Institute, Jackson

J. Meyrick Colley, Louisville
Western High School for Girls, Louisville
Highland Junior High School, Louisville
Southern Junior High School, Louisville

Brinton B. Davis, Louisville
Home Economics Building, School Library and School Dormitory; Western Kentucky State Teachers College, Bowling Green
Stadium and Gymnasium, same
High School, Bardstown

O. W. Holmes, Louisville
Mt. Tabor Grade School, New Albany Township, Floyd County, Ind.
Ohio Falls Grade School, Clarksville, Ind.
Oregon Township Grade School, Marysville, Ind.

C. W. Kimberlin, Owensboro
Thruston Consolidated School, Thruston
St. Francis Academy, Owensboro
Beaver Dam Graded and High School, Beaver Dam

Albert F. Klein, Ashland
Wm. C. Condit Grade School, Ashland
Jno. F. Hager Grade School, Ashland
Booker T. Washington Grade School, Ashland

Nevin, Wischmeyer & Morgan, Louisville
High School, Harrodsburg
Louisville Collegiate School, Louisville
Augusta Tilghman High School, Paducah

Leo L. Oberwarth & Son, Frankfort
High School and Auditorium, Frankfort
Auditorium and School Building, Institute for Backward Children, Frankfort
Consolidated School, Bagdad

G. Tandy Smith, Jr., Paducah
Group of four buildings, Murray State Teachers College, Murray
Andrew Jackson Grade School, Paducah
Butler High School, Princeton

LOUISIANA

William R. Burk, New Orleans
Harahan Grammar School, Harahan
Hope Haven Agricultural and Mecahnical School, Marrero
DeLaSalle Normal School, Lafayette

E. A. Christy, New Orleans
Henry W. Allen Elementary School, New Orleans
Lafayette Elementary School, New Orleans
Samuel J. Peters Boys High School of Commerce, New Orleans

Herman J. Duncan, Alexandria
Winnfield High School, Winnfield
Churchpoint High School, Churchpoint
Eunice High School, Eunice

Favrot & Livaudais, Ltd., New Orleans
Southwest Louisiana Industrial Institute, Lafayette
Louisiana State Normal College, Natchitoches
Bolton High School, Alexandria

Edward F. Neild, Shreveport
Two High Schools and six Grade Schools, Shreveport
Two High Schools and Grade School, Haynesville
Junior High School, Baton Rouge

William T. Nolan, New Orleans
Baton Rouge Senior High School, Baton Rouge
Lafayette Senior High School, Lafayette
St. Joseph's Church Group, Baton Rouge: Boys' High School, teachers' residence, Gymnasium and Auditorium

Theodore L. Perrier, New Orleans
Eighth Ward School, Jefferson Parish
St. Catherine of Sienna Parochial School, Metairie Ridge
Crossman Annex, New Orleans

MAINE

Bunker & Savage, Augusta
Garrett Schenck Junior High School, East Millinocket
Guilford High School, Guilford
Elsworth High School, Elsworth

Harry S. Coombs, Lewiston
Geo. W. Stearns High School, Millinocket
Lake Street Grade School, Auburn
Martel School, Lewiston

Crowell & Lancaster, Bangor
Arts and Science Building, University of Maine, Orono
Dairy Laboratory, same
Mary S. Snow School, Bangor

MARYLAND

C. M. Anderson, Baltimore
Bruce High School, Westernport
Beall High School, Frostburg
Hanover High School, Hanover, Pa.

E. G. Blanke, Baltimore
Our Lady Mt. Carmel Roman Catholic Elementary School, Stemmers Run, Baltimore County
St. Rita's Roman Catholic School, Dundalk
St. John's Roman Catholic School, Baltimore

Buckler & Fenhagen, Baltimore
Baltimore City College, Baltimore
Charles Carroll of Carrollton Elementary School, Baltimore
Pimlico Elementary School, Baltimore

A. A. Hileman, Frederick
Maryland Park High School, Prince George's County
Maryland State School for the Deaf, Frederick
High School, Friendsville, Garrett County

A. J. Klinkhart, Hagerstown
Hagerstown High School, Hagerstown
Fairview Avenue Grade School, Waynesboro, Pa.
Hedgesville High School, Hedgesville, W. Va.

Mottu & White, Baltimore
Public School No. 69, Baltimore
Donaldson School, Ilchester, Howard County
Friends School, Baltimore

Smith & May, Baltimore
Gwynns Falls Park High School, Baltimore
Entire group, Maryland State Normal School, Salisbury
Thirty-one school buildings (total number), Baltimore County

MASSACHUSETTS

Adden & Parker, Boston
Beverly High School, Beverly
Reading Junior High School, Reading
Manter Hall School, Cambridge (Chas. H. Way, Associate Architect)

James E. Allen, Lawrence
Lawrence High School, Lawrence
Francis Leabey Elementary School, Lawrence
George W. Brown Elementary School, Newburyport

Andrews, Jones, Biscoe & Whitmore, Boston
Alumnæ Building, Women's College, Brown University, Providence, R. I.
Alpha Delta Phi Fraternity House, Amherst College, Amherst
Stratton Hall (girls' dormitory), Tufts College, Medford

W. Cornell Appleton & Frank A. Stearns, Boston
Sanford Riley Hall (dormitory), Worcester Polytechnic Institute, Worcester
Memorial Chapel, Middlesex School, Concord
Vocational School and Memorial Auditorium, Southbridge

Ashton, Huntress & Alter, Lawrence
James F. Leonard Elementary School, Lawrence
Central Junior High School, Methuen
West Junior High School, Watertown

Elmer Smith Bailey, Boston
Layout of Wm. E. Nickerson Recreation Field: Stadium, Field Houses, Football Dormitory, Boat House, etc., Boston University, Boston
School program for Sanford, Me.: Edison and Lincoln Schools and addition to the High School
School program for Manchester, N. H.: Practical Arts High School, West Side High School, and Franklin Grade School

J. Williams Beal, Sons, Boston
Whitman High School, Whitman
Rockland Junior-Senior High School, Rockland
Hanover Junior-Senior High School, Hanover

Bigelow, Kent, Willard & Co., Inc., Boston
Engineering Building, Rhode Island State College, Kingston, R. I.
Library and Auditorium, same
Armory and Gymnasium, same

William H. Brainerd Associates, Boston
Seldon L. Brown School, Wellesley
Six-grade High School, Peterborough, N. H.
Junior High School, Winthrop

Coolidge, Shepley, Bulfinch & Abbott, Boston
Medical School, Vanderbilt University, Nashville, Tenn.
Medical School and Hospital, Western Reserve University, Cleveland, Ohio
Fogg Art Museum, Harvard University, Cambridge

Frank Irving Cooper Corp., Boston
Thomas Snell Weaver High School, Hartford, Conn.
Arlington Junior High School, East Arlington
Morgan Gardner Bulkeley High School, Hartford, Conn.

Edward M. Corbett, Fall River
Technical High School, Fall River
Warren High School, Warren, R. I.
Jerome Dwelly Elementary School, Fall River

John F. Cullen, Boston
School program for city of Fall River, 1927-1930
Frank V. Thompson Junior High School, Boston
Turner's Fall Junior High School, Town of Montague

Derby & Robinson, Boston
Hingham High School, Hingham
George Washington Elementary School, Winchester
Bedford Junior High School, Bedford

Ralph Harrington Doane, Boston
Armitage Grade School, West Cliftondale
Lincoln Avenue Elementary School, Cliftondale
Sharon High School, Sharon

William W. Drummey, Inc., Boston
Wm. McKinley School, Revere
High School, Narragansett, R. I.
Beethoven School (First Standard School), Boston

M. A. Dyer Co., Boston
Municipal Group, Webster: Town Office Building, Senior High School, Junior High School, and Auditorium (one building)
Leominster Junior High School, Leominster
Milton F. Roberts Junior High School, Medford

E. C. & G. C. Gardner, Springfield
Dormitory and Campus Group, International Y. M. C. A. College, Springfield
Technical High School, Springfield
Junior High School, Stafford Springs, Conn.

Edward T. P. Graham & F. Stillman Fish, Boston (also Cleveland, Ohio)
St. Timothy's School, Garfield Heights, Ohio
Our Lady of Peace School, Cleveland, Ohio
Cathedral Latin School, Cleveland, Ohio

Charles R. Greco, Boston
Roberts Intermediate School, Cambridge
Horace Mann School for Deaf Mutes, Boston
Winthrop Grammar School, Melrose

Malcolm B. Harding, Westfield
Bay Path Institute, Springfield
High School, Belchertown
Consolidated Grade Schools, Southwick

Haven & Hoyt, Boston
Newton Central High School, Newton
New England Conservatory of Music, Boston
Salem Hospital Training School Home for Nurses, Salem

Haynes & Mason, Fitchburg
John E. Fitch High School, Groton, Conn.
Peaticket Grade School, Falmouth
Groton High School, Groton

Henry & Richmond, Boston
Samuel Phillips Recitation Hall and Morse Laboratory of Chemistry, Physics and Biology, Phillips Academy, Andover
Bridgewater State Normal Group, Bridgewater
Hamilton School, Newton

Hutchins & French, Boston
Henry Whittemore Grade School, Waltham
Group of buildings, Tilton School, Tilton, N. H.
High School, Kennebunk, Me.

Thomas M. James Co., Boston
Deering High School, Portland, Me.
Nashua High School, Nashua, N. H.
Berlin High and Junior High Schools, Berlin, N. H.

Kilham, Hopkins & Greeley, Boston
Alexander Hamilton Junior High School No. 2, Elizabeth, N. J.
James Russell Lowell Grade School, Watertown
George S. Baldwin Grade School and Library, Brookline

J. D. Leland & Co., Boston
Junior High School, Concord, N. H.
Junior High School, Worcester
Group of Grade Schools, Hudson

Morris W. Maloney, Springfield
Elias Brookings School, Springfield
Samuel Bowles School, Springfield
Robert O. Morris School, Springfield

George F. Marlowe, Boston
Lyon Hall, Babson Institute, Wellesley
Bryant Hall, same
Richard Knight Auditorium, same

McLaughlin & Burr, Boston
Hyde Park High School for Boys and Girls, Boston
Senior High School, Port Washington, Long Island, N. Y.
Coolidge Junior High School, Natick

Maurice P. Meade, Boston
High School, St. Mary of the Assumption Parish, Brookline
Elementary School, St. Bernard's Parish, West Newton
Girls Elementary School, St. Clement's Parish, Medford

Mulhall & Holmes Co., Boston
Ralph Waldo Emerson School, Boston
Charles Logue Elementary School, Boston
Milford Elementary School, Milford

Perry, Shaw & Hepburn, Boston
Roxbury Latin School, West Roxbury
New Group for Radcliffe College, Cambridge
Dexter School, Brookline

James H. Ritchie & Associates, Boston
Massachusetts Agricultural College Group, Amherst
High School, Everett
High School, Westboro

Jasper Rustigian, Worcester
Nelson Place School, Worcester
Bloomingdale Road School No. 2, Worcester
Middlesex Avenue School, Worcester

Sanborn & Weed, Lynn
Home-Making School for Girls, Essex County Agricultural School, Hathorne
Cobbett Elementary School and Administration Building (for School Department), Lynn
Tracy Elementary School, Lynn

Matthew Sullivan, Boston
Refectory Building, St. John's Preparatory School, Danvers
St. Thomas' High School, Jamaica Plain, Boston
Our Lady of Grace School, Everett

William Tallman, New Bedford
East Fairhaven Elementary School, Fairhaven
Roosevelt Junior High School, New Bedford
Onset District Elementary School, Wareham

Edward I. Wilson, Boston
Second unit, Revere Senior-Junior High School, Revere
James A. Garfield Junior High School, Revere
Elementary School, Washington-Allston District, Boston

MICHIGAN

Frank P. Allen & Son, Grand Rapids
Grade and High School, Comstock Park
Grade School, Wyoming Park
Second Ward Grade School, Belding

Billingham & Cobb, Kalamazoo
Dowagiac High and Grade School, Dowagiac
Central High School, South Haven
Harding Grade School, Kalamazoo

Colton & Knecht, Grand Rapids
Gymnasium, St. Andrew's Cathedral Parish High School, Grand Rapids
St. Thomas' School and Chapel, Grand Rapids
St. Isidore's School, Grand Rapids

Cowles & Mutscheller, Saginaw
Central Junior High School, Saginaw
Kinney School, Mt. Pleasant
Daniel Axford Grade School and Auditorium, Oxford

Donaldson & Meier, Detroit
Sacred Heart Seminary Group, Roman Catholic Diocese of Detroit
Elizabeth Cleveland Intermediate School (for Board of Education), Detroit
Thomas M. Cooley High School, same

A. H. Ellwood & Son, Kalamazoo
Covert Centralized School, Covert
Beardsley School, Elkhart, Ind.
Lawrence High School, Lawrence

R. V. Gay, St. Johns
Rogers City High School, Rogers City
Carpenter Street Grade School, Midland
Wenzel Street Grade School, Sturgis

Aaron H. Gould & Son, Detroit
New group of buildings, Wayne County Training School, Northville
High School, Flat Rock
Juvenile Detention School, Detroit

George J. Haas, Detroit
Grosse Pointe High School, Grosse Pointe
Lakeview High School, Ste. Claire Shores
Hamtramck High School, Hamtramck

Warren S. Holmes Co., Lansing
National Kindergarten and Elementary College, Evansville, Ill.
Robert J. Vance Elementary School, New Britain, Conn.
Albion High School, Albion, Mich.

Derrick Hubert, Menominee
Niagara Junior-Senior High and Grade School, Niagara, Wis.
National Mine High and Grade School, National Mine
Watersmeet High and Grade School, Watersmeet

Albert Kahn, Inc., Detroit
Museums Building, University of Michigan, Ann Arbor
Medical Building, same
Angell Hall, same

LeRoy & Newlander, Kalamazoo
Central High School, Kalamazoo
Slocum Truax High School, Trenton
Grade and High School, Watervliet

Frederick D. Madison, Royal Oak
1927 Royal Oak High School and All-Grade School, Royal Oak
Adams Junior High School, Birmingham
Big Beaver School, Big Beaver

Malcomson & Higginbotham, Detroit
Roosevelt Teachers College Group, Detroit
University of Detroit Group, Detroit
Administration Building, Central State Teachers College, Mt. Pleasant

George D. Mason & Co., Detroit
Ulysses S. Grant School, Detroit
Dearborn High School, Dearborn
Charles A. Lindbergh School, Dearborn

McGrath & Dohmen, Detroit
William Ruthruff School, Detroit
John A. Logan School, Detroit
Annie Lathrup School, Birmingham

Harry L. Mead, Grand Rapids
St. Adalbert's Grade School, Grand Rapids
St. Philip's Grade School, Battle Creek
Jefferson Grade School, Ionia

F. E. Parmelee, Iron Mountain
L'Anse High School, L'Anse
Iron Mountain Junior High School, Iron Mountain
Kingsford High School, Kingsford

Lewis J. Sarvis, Battle Creek
Lakeview Consolidated School, Battle Creek
Fremont School, Battle Creek
Southwestern Junior High School, Battle Creek

Smith, Hinchman & Grylls, Detroit
Roosevelt High School, State Normal College, Ypsilanti
Mackenzie High School, Detroit
Robert Trombly Elementary School, Grosse Pointe

Taylor & Tanner, Detroit
Garfield School, Adrian
Lincoln School, Adrian
McKinley School, Adrian

H. H. Turner & V. E. Thebaud, Grand Rapids
Burton Junior High and Elementary School, Grand Rapids
Nelson Elementary and Crippled Children's School, Muskegon
Monroe Junior and Senior High School, Monroe

VanLeyen, Schilling & Keough, Detroit
Fordson High School, Fordson
Birmingham High School, Birmingham
River Rouge High School, River Rouge

Verner, Wilhelm & Molby, Detroit
Orion Combined High and Grade School, Orion
LaFayette Grade School, Lincoln Park
Brighton High School, Brighton

B. C. Wetzel & Co., Detroit
Roosevelt High School, Wyandotte
Andrew Jackson Junior High School, Detroit
Woodruff Grade School, Wyandotte

Albert Wood, Detroit
James Gardner Grade School, Detroit
Davy Street Grade School, Detroit
Beech Street Grade School, Dearborn

MINNESOTA

Croft & Boerner, Minneapolis
Washington Park High School, Racine, Wis.
Consolidated School, Renville
Junior-Senior High School, Ironwood, Mich.

W. R. Dennis, Fergus Falls
Addition to Fergus Falls High School, Fergus Falls
High and Grade School, Oakes, N. Dak.
St. Mary's Parochial School, Breckenridge

Le Roy Gaarder, Albert Lea
Consolidated Grade and High Schools, Freeborn
Consolidated Grade and High Schools, Alden
New Grade School additions, Albert Lea

F. H. Hafey, Minneapolis
John Marshall High School (for Board of Education), Minneapolis
Washburn Junior High School, same
Maria Sanford Junior High School, same

William M. Ingemann, St. Paul
Macalester College Group, St. Paul (Associate Architect)
Dormitory, Gustavus Adolphus College, St. Peter
New group of Dormitory Buildings (designs and floor plans), University of Minnesota, Minneapolis

C. H. Johnston, St. Paul
Main Building, State Teachers College, Mankato
Main Building, State Teachers College, Winona
Dormitory for Men, University of Minnesota, Minneapolis

Lang, Raugland & Lewis, St. Paul
New group of buildings, Luther Theological Seminary, St. Paul
Slayton High School, Slayton
Grade School for Common School District No. 21, Golden Valley, Hennepin County

Long & Thorshov, Inc., Minneapolis
Concordia College Group, St. Paul; new Campus layout, new Administration Building, and Dormitory
Northwestern Bible School, Minneapolis

Geo. Pass & Son, & P. T. Rockey, Mankato
Franklin Grade and Junior High School, Mankato
Plainview Complete School, Plainview
St. Peter High School, St. Peter

Albert G. Plagens, New Ulm
St. Anne's Parochial School, Wabasso
Boys' Dormitory, Dr. Martin Luther College, New Ulm
Community Building and High School Gymnasium, Glencoe

C. H. Smith, Duluth
Washburn Grade School, Duluth
Junior High School, Gilbert
Memorial High School, Ely

J. C. Taylor, Hibbing
Brooklyn Grade School, Hibbing
Parochial Junior High School, Hibbing
Cherry High School, Cherry

Toltz, King & Day, Inc., St. Paul
Junior-Senior High School Group, South St. Paul
Dr. Martin Luther College Group, New Ulm
High School, New Prague

MISSISSIPPI

Harry North Austin, Jackson
Administration Building, Millsaps College, Jackson
Men's Dormitory, same
Library, same

Emmett J. Hull, Jackson
High School, Brookhaven
Chamberlain-Hunt Academy Group, Port Gibson
Gulfport Junior High School, St. Petersburg, Fla.

P. J. Krouse, Meridian
High School Building, Natchez
Junior High School, Laurel
M. S. C. W. Group, Columbus: Dormitory, Dining Hall, Physical Education, Administration

Wilfred S. Lockyer, Gulfport
New group of buildings, Harrison-Stone-Jackson Agricultural High School and Junior College, Perkinson, Miss.: Auditorium, Science Department, Boys' Dormitory, Girls' Dormitory, Gymnasium, Power-House, new dining room and modern kitchen

Shaw & Woleben, Gulfport
Central Elementary School, Gulfport
Pascagoula High School, Pascagoula
Long Beach School, Long Beach

Vinson B. Smith, Jr., Gulfport
Three buildings, Mississippi State Teachers College, Hattiesburg
Two buildings, Industrial Training School, Columbus

J. M. Spain, Jackson
Administration Building, Blue Mountain College, Blue Mountain
Boys' Dormitory, Mississippi College, Clinton
Administration Building, Hinds County Junior College, Raymond

MISSOURI

Ludwig Abt, Moberly
Grade School and Auditorium Building, Slater
Grade School and Auditorium Building, Fayette
Grade and High School, Atlanta

Bonsack & Pearce, Inc., St. Louis
Ozark Wesleyan College, Carthage
Hardin College Group, Mexico
High School, Bonne Terre

Walter Boschen, St. Joseph
Neeley School, St. Joseph
Hosea School, St. Joseph
Gymnasium, Northwest Missouri State Teachers College, Maryville

Ernest O. Brostrom, Kansas City
Rock Creek Rural School, Independence
Raytown High School, Raytown
Educational Building, Presbyterian Church, Fort Scott, Kans.

Eckel & Aldrich, St. Joseph
Whittier School, St. Joseph
Two buildings, Missouri State School, Marshall
Group of buildings, Palmer College, Albany

Harry C. Eckland & Co., Kansas City
Iowa Wesleyan College Group, Mt. Pleasant, Iowa
Bethany College Group, Lindsborg, Kans.
High School, Muscatine

Ben C. Elliott, Mexico
Mexico Junior and Senior High School, Mexico
Bellflower High School, Bellflower
St. Brendan's School, Mexico

Felt, Dunham & Kriehn, Kansas City
Junior High School, Emporia, Kans.
Columbia Elementary School, Joplin
Junior High School, Beatrice, Nebr.

Ferrand & Fitch, St. Louis
Flynn Park Grade School, University City
Three buildings, Drury College, Springfield
Gymnasium, Iberia Academy, Iberia

Frederick C. Gunn, Kansas City
Training School for Nurses, General Hospital, Kansas City
Training School and Clinic No. 2 (colored), General Hospital, Kansas City
Headquarters Building, Church of the Nazarene, Kansas City

Hoener, Baum & Froese, St. Louis
High School, Owensville
Church School, Cape Girardeau
High School, Jennings

Wm. B. Ittner, Inc., St. Louis
Horace Mann Complete School, Gary, Ind.
Longview Complete School, Longview, Wash.
Jefferson Elementary School, Battle Creek, Mich.

Jamieson & Spearl, St. Louis
Biology, Art and Women's Building, Washington University, St. Louis
Law School, University of Missouri, Columbia
Agricultural and Engineering Buildings, University of Arkansas, Fayetteville, Ark.

La Beaume & Klein, St. Louis
John Burroughs Country Day School, St. Louis County
Washington University School of Dentistry, St. Louis
Irwin Hall Dormitory, Lindenwood College, St. Charles

Madorie & Bihr, Kansas City
Redemptorist High School, Kansas City
St. Michael's Parochial School, Kansas City
St. Joseph's Parochial School, Kansas City

C. F. McClean, Cameron
Grade School, Cameron
Science Hall, Missouri Wesleyan College, Cameron
Girls' Dormitory, same

R. M. Milligan, St. Louis
Theodore Roosevelt High School, St. Louis
William Beaumont High School, St. Louis
Public Schools' Stadium, St. Louis

Owen, Sayler & Payson, Kansas City
Senior High School, Jefferson City
William Chrissman Senior High School, Independence
Senior High School, Marshall

H. D. Pampel, Kansas City
Raytown High School, Raytown
Dodson Grade and High Schools, Dodson
Brookfield High and Grade School, Brookfield

L. Baylor Pendleton, St. Louis
Hall of Science, Mayfield College, Lutesville
Girls' Dormitory, same
Baptist Educational Building, Columbia

Geo. M. Siemens (successor to Root & Siemens), Kansas City
Rodman Hall (classroom building), St. Marys College, St. Marys, Kans.
Campus plan and College Group, same
Gymnasium and Chapel Building, Kidder Institute, Kidder

Chas. A. Smith, Kansas City
Westport Junior High School, Kansas City
Administration and Chapel Building, William Jewell College, Liberty
Horace Mann Teachers Training School, Pittsburg, Kans.

Henry C. Smith, Independence
Graceland College Group, Lamoni, Iowa
Kappa Sigma Fraternity House, Lawrence, Kans.
Alpha Chi Omega Sorority House, same

Study & Farrar, St. Louis
Teachers Training School, Southeast Missouri State Teachers College, Cape Girardeau
Price District School, Clayton
Sappington Grade School, Sappington

MONTANA

Bird & van Teylingen, Great Falls
Great Falls High School, Great Falls
Conrad High School, Conrad
Roosevelt Grade School, Great Falls

R. C. Hugenin, Missoula
State University Group, Missoula
School of Mines Group, Butte
Girls Vocational School Group, Helena

Shanley & Baker, Great Falls
Gymnasium and Biology Buildings, Montana State College, Bozeman
Anaconda Junior High School, Anaconda
Junior and Senior High School, Glasgow

Fred F. Willson, Bozeman
Boys' Central High School, Butte
Gymnasium, State Normal College, Dillon
Woman's Building, Montana State College, Bozeman

NEBRASKA

Arthur D. Baker, Grand Island
Refectory Building, Lutheran Teachers College, Seward
Senior High School, Grand Island
Holbrook Combination High and Grade School, Holbrook

N. R. Brigham, Omaha
Pershing Grade and Junior High School, East Omaha
Underwood Grade and Junior High School, Omaha
Monroe Grade School, Omaha

Leo A. Daley, Omaha
New group of buildings, St. Columban's Preparatory Seminary, near Silver Creek, N. Y.
Sacred Heart Academy, Greeley
New group of buildings, Nebraska School for the Deaf, Omaha

Davis & Wilson, Lincoln
Field House and Stadium, University of Nebraska, Lincoln
Kearney Junior High School, Kearney
Everett Junior High School, Lincoln

Everett S. Dodds, Omaha
Petersburg Grade and High School, Petersburg
Modale Consolidated School, Modale, Iowa
Walthill Public School, Walthill

E. L. Goldsmith & Co., Scottsbluff
Wheatland Grade School, Wheatland, Wyo.
Minatare High School, Minatare
Orleans High School, Orleans

J. P. Helleberg, Kearney
State Training School, Kearney
Lexington High School, Lexington
Overton High and Grade School, Overton

John Latenser & Sons, Omaha
New group of buildings, Creighton University, Omaha
South High School, Omaha
Shelby Consolidated School, Shelby

Chas. W. Steinbaugh, Omaha
Washington Grade School, Omaha
High School, Manning, Iowa
Walnut Hill Grade School, Omaha

Jas. C. Stitt, Norfolk
High School, Norfolk
Training School, State Normal College, Chadron
Gymnasium, same

NEVADA

F. J. DeLongchamps, Reno
Women's Dormitory, University of Nevada, Reno
Educational Building, same
Sparks Junior High School, Sparks

NEW JERSEY

Charles F. Ackerman, Newark
Public School, Essex Fells
Blessed Sacrament School, Elizabeth
St. Elizabeth's School, Linden

Rolf William Bauhan, Princeton
Hun School Group, Princeton
Solebury School Group, New Hope, Pa.
Princeton Preparatory School Group, Princeton

Cornelius V. R. Bogert, Hackensack
Fisher Avenue School, Bogota
Bogota High School, Bogota
State Street School, Hackensack

H. B. Brady, Inc., Elizabeth
Thomas Jefferson Senior High School, Elizabeth
Linden Junior High School, Linden
Theodore Roosevelt School, Cranford

J. Frederick Cook, Newark
School for Crippled Children, Newark
St. John's College High School, Brooklyn, N. Y.
Addition to East Side High School, Newark

Henry Barrett Crosby, Paterson
Grammar School No. 6, Paterson
Grammar School No. 13, Clifton
Grammar School No. 15, Clifton

Arthur E. Doré, Hackensack
Elementary School No. 6, West New York
Elementary and Junior High School No. 4, Hackensack
Elementary School, Westwood

Vincent J. Eck, Red Bank
Red Bank Catholic High School, Red Bank
St. Nicholas' High School, Egg Harbor City
Star of the Sea Academy (High School), Long Branch

Edwards & Green, Inc., Camden
Gloucester City High School (for Board of Education), Gloucester City
J. Heulings Coles School (for Board of Education), Delaware Township, Camden County
Erlton School, same

Fanning & Shaw, Paterson
Eastside Senior High School, Paterson
Elementary School No. 8, Paterson
Monroe Street Elementary and Junior High School, Ridgewood

Greisen & Tuzik, Perth Amboy
Middlesex County Vocational School No. 2, Perth Amboy
Public School No. 11, Perth Amboy
Clara Barton School, Raritan Township

Guilbert & Betelle, Newark
Columbia High School, South Orange and Maplewood
State Normal School, New Britain, Conn.
Washington Irving High School, Tarrytown, N. Y.

Hacker & Hacker, Fort Lee
Teaneck High School, Teaneck
Dumont High School, Dumont
William Cullen Bryant School, Teaneck

Hill & Gollner, Trenton
Public School, Williamstown
Witherspoon Street School, Princeton
Grade School, Aura

John F. Kelly, Passaic
Passaic Memorial School, Passaic
Public School No. 12, Passaic
Public School No. 1, Passaic

Lackey & Hettel, Camden
Hammonton High School, Hammonton
Delair School, Pensauken
Camden County Vocational School, Pensauken Township

Lee & Hewitt, Paterson (also New York City)
Clifton High School, Clifton
School No. 15, Paterson
Davison Avenue School, Lynbrook, N. Y.

Lucht & Anderson, Cliffside Park
Presbyterian Church School, Leonia
Trinity Evangelical Lutheran Church School, Hudson Heights
Swedish Evangelical Mission Church School, West New York

Wm. Mayer, Jr., West New York
Memorial High School, West New York
Public School No. 1, West New York
Public School No. 5, Cliffside Park

Arnold H. Moses, Camden
Pensauken Junior High and Grade School, Pensauken Township
Audubon High School, Audubon
Merchantville High School, Merchantville

Ernest Sibley & Lawrence C. Licht, Palisade
High School, Princeton
High School, Orange
School for District No. 1 and Owen D. Young, Van Hornesville, N. Y.

Simpson & Rolston, Inc., Newark
Buckley School (private), Greenvale, N. Y.
Buckley School (private), Rumson
High School, Mechanicville, N. Y.

Wm. W. Slack & Son, Trenton
Lincoln Elementary and Intermediate School, Trenton
Junior High School, Oxford Furnace
Greenwood Junior High School, Trenton

A. L. Vegliante, Garfield
Midland School No. 1, Midland Township
Roosevelt School No. 7, Garfield
Roosevelt School No. 7, Lyndhurst

Fred Wesley Wentworth, Paterson
School No. 13, Paterson
Wayne School, Wayne Township
Monroe High School, Monroe, N. Y.

NEW MEXICO

Gaastra, Gladding & Johnson, Albuquerque (also Santa Fe)
Eugene Field Grade School, Albuquerque
Gormley Grade School, Santa Fe
University of New Mexico Group, Albuquerque: Biological Building, Gymnasium, Lecture Hall and Dormitory

NEW YORK

Carl C. Ade, Rochester
Lyons High School, Lyons
Charles Perkins School, Newark
Waterloo High School, Waterloo

Allen & Collens, New York City
Union Theological Seminary Group, New York City
Hartford Theological Seminary Group, Hartford, Conn.
Library, Teachers College, New York City

Bagg & Newkirk, Utica
Sage Athletic Building, Hamilton College, Clinton
Biology-Geology Laboratories, same
Theta Chi Fraternity House, Colgate College, Hamilton

William J. Beardsley, Poughkeepsie
Governor George Clinton School No. 8, Poughkeepsie
Glen Cove School, Glen Cove
S. F. B. Morse School No. 5, Poughkeepsie

Edward J. Berg, Utica
Our Lady of Lourdes Parochial School, Utica
Parochial School for Church of The Annunciation, Ilion
St. Mary's Parochial School, Oneonta

Wesley Sherwood Bessell, New York City
Mount Vernon Seminary, Washington, D. C.
Group of Schools, Great Neck
Public School, Port Washington

Gerard W. Betz, Kingston
Grade and High School, Walden
Grade School, Glasco
Grade School, Kingston

Frank H. Bissell, New York City
St. Gabriel's School, New Rochelle
Roger Ludlow Junior High School, Norwalk, Conn.
Rye Neck High School, Mamaroneck

Bley & Lyman, Buffalo
Canisus College Group, Buffalo
Lackawanna High School, Lackawanna
Harding School, Kenmore

R. L. Bowen, Schenectady
Euclid Elementary School, Schenectady
Oneida Intermediate School, Schenectady
Mt. Pleasant High School, Schenectady

Clarence W. Brazer, New York City
Glen-Nor High School, Glenolden, Pa.
Leonardo High School, Leonardo, N. J.
Prospect Park School, Delaware County, Pa.

Charles A. Carpenter, Rochester
Phelps Union and Classical School, Phelps
Departmental Church School, Christ Episcopal Church, Poughkeepsie
Departmental Church School, First Methodist Episcopal Church, Lockport

George Cary, Buffalo
Buffalo Historical Building, Buffalo
Medical and Chemistry Departments, University of Buffalo, Buffalo
Dental College, same

G. Howard Chamberlin, Yonkers
Chas. E. Gorton High School, Yonkers
Roosevelt High School, Yonkers
Nathaniel Hawthorne Junior High School, Yonkers

Walter B. Chambers, New York City
Bingham and McClellan Halls (dormitories), Yale University, New Haven, Conn.
Lawrence Hall (lecture) and Stillman Hall (dormitory), Colgate University, Hamilton
Sykes Memorial Manual Training and High School, Rockville, Conn.

Carl W. Clark, Cortland
Baldwinsville High School, Baldwinsville
Massena Grade and High Schools, Massena
Warners High School, Warners

Coffin & Coffin, New York City
Saratoga Springs High School, Saratoga Springs
Group of buildings, El Instituto Ingles, Santiago, Chile
Two Elementary Schools, Greenwich, Conn.

Conable, Smith & Rowley, New York City
Administration Building, Lecture Halls and Dormitory, Wagner College, Staten Island
Cortland High School, Cortland
North Side School, East Williston

Conrad & Cummings, Binghamton
Benjamin Franklin School, Binghamton
Alexander Hamilton School, Binghamton
Westover School, Johnson City

Crow, Lewis & Wick, New York City
Sage Engineering Building, New York University, New York City
School of Aeronautics, same
Library Building, College of the City of New York, New York City

Howard F. Daly, Amsterdam
East Main Street Grade School, Amsterdam
Junior High School, Amsterdam
Fifth Ward Grade School, Amsterdam

R. H. Dana, Jr., New York City
Group of eleven buildings, Loomis Institute, Windsor, Conn.
Group of five buildings, Gunnery School, Washington, Conn.
St. Margaret's School, Waterbury, Conn.

Delano & Aldrich, New York City
Recitation Building, Lawrenceville School, Lawrenceville, N. J.
Sterling Chemistry Laboratory, Yale University, New Haven, Conn.
Music School, Smith College, Northampton, Mass.

Dennison & Hirons, New York City
Beaux Arts Institute of Design, Beaux Arts Society, New York City
Rye County Day School, Rye
Valley Stream School, Valley Stream

O. W. & H. B. Dryer, Rochester
Fairport High School, Fairport
East Rochester Grade School and Gymnasium, East Rochester
Honeoye Falls New Grade and High School, Honeoye Falls

Joseph E. Fronczak, Buffalo
Villa Maria Academy and Convent, Buffalo
Our Lady of Czestochowa Parochial School, Cheektowaga
St. Stanislaus Kostka Elementary School, Rochester

August Henry Galow, Huntington
Lincoln School, Huntington Station
Franklin Square School, Hempstead
Central School, South Huntington

Clarence H. Gardinier, Albany
New Quadrangle Group and Faculty Houses, St. Stephen's College, Annandale-on-Hudson
High and Grade School, Schuylerville
High and Grade School Unit, Rhinebeck

Archibald F. Gilbert, New York City
Lowville Academy and Grade School, Lowville
Alexandria Bay Grade and High School, Alexandria Bay
Granville High School, Granville

Thomas L. Gleason, Albany
College of St. Rose, Albany
Public School No. 27, Albany
Cathedral Academy, Albany

Wm. H. Gompert, New York City
New York Training School for Teachers, New York City
DeWitt Clinton High School, New York City
Theodore Roosevelt High School, New York City

Goodwillie & Moran, New York City (also Montclair, N. J.)
Central Grade School, Glen Ridge, N. J.
Linden Avenue School, Glen Ridge, N. J.
St. Luke's Parish School, Montclair, N. J.

Gordon & Kaelber, Rochester
Medical School and Hospital, University of Rochester, Rochester
New group of twelve buildings, Mens College, same
Benjamin Franklin High School, Rochester

Robert R. Graham, Middletown
Central Valley Junior High and Grammar School, Central Valley
Germantown High and Grade School, Germantown
Pine Island Central Rural High and Grammar School, Pine Island

Edw. B. Green & Sons—A. H. Hopkins, Buffalo
Kibler High School, Tonawanda
Nichols Country Day School for Boys, Buffalo
Brooklyn Avenue School, Union Street School, and Hutchins-South Jackson Streets School, Batavia

Edward Hahn, Hempstead
Floral Park Elementary School, Floral Park
The Mamaroneck High School, Mamaroneck
Floral Park-Bellrose Grade and Junior High School, Floral Park-Bellrose

Earl Hallenbeck, Syracuse
Liverpool High School, Liverpool
Canastota High School, Canastota
Stackbridge Valley School, Munnsville

Haskell & Considine, Elmira
Horseheads Junior and Senior High School, Horseheads
School for District No. 4
School for District No. 6

Helmle, Corbett & Harrison, New York City
Theodore Roosevelt High School, New York City (Associate Architect)
DeWitt Clinton High School, New York City (Associate Architect)
Far Rockaway High School, New York City (Associate Architect)

John Mead Howells, New York City (originally Howells & Stokes)
Music Department and Memorial Gateway, Harvard University, Cambridge, Mass.
Administration Building, Carnegie Swimming Pool and Memorial Gateway, Yale University, New Haven, Conn.
St. Paul's Chapel, Columbia University, New York City

Paul Hueber, Syracuse
St. John the Baptist School, Syracuse
St. Brigiol's School, Syracuse
St. Mary's School, same

Paul F. Jagow, Lynbrook
Lynbrook Grade School, Lynbrook
Lakeview Grade School, Malverne
Rhame Avenue Grade School, East Rockaway

Louis Jallade, New York City
Grade School, Scarsdale
Summer Training School Group, Blue Ridge, N. C.
Gymnasium, Union Theological Seminary, New York City

Oliver R. Johnson, Jamestown
Lakewood High School, Lakewood
Westfield High School, Westfield
Ripley High School, Ripley

Johnstone & Eggert, North Tonawanda
Highland School, Tonawanda
Wurlitzer School, North Tonawanda
Ironton School, North Tonawanda

William H. Jones, Yonkers
Church and School of Our Lady of Refuge, Bronx, New York City
Parochial School for the Parish of St. Denis, Yonkers
Parochial School for the Parish of the Immaculate Conception, Stapleton, Staten Island

L. J. Kaley, Binghamton
Harry L. Johnson School, Johnson City
Christopher Columbus School, Binghamton (Associate Architect)
Addition to Woodrow Wilson School, Binghamton

F. J. & W. A. Kidd, Buffalo
East High School, Buffalo
Riverside High School, Buffalo
Kenmore High School, Kenmore

Beverly S. King, New York City
Library, Carthage College, Carthage, Ill.
The Pingray School, Elizabeth, N. J.
Public School, Garnersville

Melville L. King, Syracuse
Solvay High School, Solvay
East Syracuse High School, East Syracuse
Continuation School, Syracuse

Frank W. Kirkland, Rome
Columbus Grade School, Rome
DeWitt Clinton Grammar and Grade School, Rome
Forestport Union Free School, District No. 10, Forestport

Kirkpatrick & Cannon, Niagara Falls
Trott Vocational School, Niagara Falls
Niagara University Group, Niagara Falls: Dormitory Group, Gymnasium

Knappe & Morris, New York City
Stamford High School, Stamford, Conn.
St. Teresa's Parochial School, North Tarrytown
Hendrick Hudson High School, Montrose

A. Lawrence Kocher, New York City
Grade School, Pennsylvania State College, State College, Pa.
Dairy Barn, same
Grade School, Berwick, Va.

T. I. Lacey & Son, Binghamton
East Junior High School, Binghamton
Addition to High School, Endicott
Henry B. Endicott Grade School, Endicott

W. W. La Chance, Niagara Falls
17th Street Public School, Niagara Falls
Ferry Avenue Public School, Niagara Falls
Center Avenue Public School, Niagara Falls

Simon Larke & Russell G. Larke, Niagara Falls
Hyde Park Grade School, Niagara Falls
Also schools in association with others, cooperating as Associated Architects of Niagara Falls

Electus D. Litchfield, New York City
Macalester College Group, St. Paul, Minn.: General Group Plan for future development; Boys' Dormitory, Gymnasium, and Power-House

Edward W. Loth, Troy
St John's Parochial Academy, Rensselaer
St. John's Parochial Junior High School, Rensselaer
Public School No. 12, Troy

Ludlow & Peabody, New York City
Group of five buildings, George Peabody College for Teachers, Nashville, Tenn.
Group of seven buildings, Hampton Institute, Hampton, Va.
Gymnasium and other buildings, Stevens Institute, Hoboken, N. J.

Henry J. McGill & Talbot F. Hamlin, New York City
Brescia Hall (dormitory) and Science Hall, College of New Rochelle, New Rochelle
Convent and Parish Hall, SS. Simon and Jude's Parochial Grade School, Brooklyn
Ursuline School for Girls (Academy), New Rochelle

W. Philip McGovern, New York City
St. Francis' College, Brooklyn
St. Mark's School, Sheepshead Bay
Resurrection School, Gerrittsen Beach

McKim, Mead & White, New York City
Harvard Business School, Boston, Mass.
Olin Memorial Library, Wesleyan College, Middletown, Conn.
Chemistry Building, Columbia University, New York City

Henry Killam Murphy, New York City
Hopkins Grammar School, group of new buildings, New Haven, Conn.
Yenching University group of new buildings, Peking, China
Ginling College group of new buildings, Nanking, China

Chas. F. Obenbach, Niagara Falls
Administration Building, Board of Education, Niagara Falls
Niagara Falls High School, Niagara Falls (Associate Architect)
North Junior High School, Niagara Falls (Associate Architect)

Oberlies & Lorenz, Rochester
Nazareth Academy, Rochester
St. Boniface School, Rochester
St. John the Baptist School, Lockport

James W. O'Connor, Architect; **James F. Delany & Paul Schulz,** Associates, New York City
Complete group, Manhattan College, New York City
La Salle Military Academy, Oakdale
Complete group, All Hallows Institute, New York City

Gerald Jos. O'Reilly, New York City
Citrus Grove Grade School, Miami, Fla.
Lemon City Agriculture and Trade High School, Miami, Fla.
Larkin Public School—Little River Public School, Larkin, Fla.

Peabody, Wilson & Brown, New York City
Westbury High School, Westbury
Grade School, Cold Spring Harbor
Grade School, Woodbury

Pember & Demers, Albany
Utica Country Day School, New Hartford
Lake Placid High School, Lake Placid
Public School No. 20, Albany

Pierce & Bickford, Elmira
South Side High School, Elmira
Elm Street School, Waverly
Cook Academy Gymnasium, Montour Falls

Charles A. Platt, New York City
Library, University of Illinois, Urbana, Ill.
Architectural Building, same
George Washington Hall, Phillips Academy, Andover, Mass.

Wilson Potter, New York City
High School, Bristol, Conn.
High School, Geneva
High School, Oneida

Randall & Vedder, Syracuse
Danforth Grade and Normal School, Syracuse
Washington Irving Grade School, Syracuse
Sayre High School, Sayre, Pa.

Rasmussen & Wayland, New York City
Bernardsville High School, Bernardsville, N. J.
Allendale Grade School, Allendale, N. J.
Wilson Borough Junior-Senior High School, Easton, Pa.

Victor Reeser, Inc., New York City
Group of buildings, St. Joseph's School for the Instruction of the Blind, Jersey City, N. J.: main building, annex and dormitories

Robert J. Reiley, New York City
Cathedral High School, New York City
Girls' Catholic High School, Brooklyn
St. Jean Baptist School, New York City

Marcus T. Reynolds; Kenneth C. Reynolds, Associate, Albany
School Four, Albany
William I. Hackett Junior High School, Albany
Albany Academy Group, Albany

Ralph M. Rice, New York City
West Street Grade School, Newburgh
Chestnut Street School, Newburgh
Addition to Beacon High School, Beacon

James Gamble Rogers, New York City
Northwestern University Group, Chicago, Ill.
Harkness Memorial, Yale University, New Haven, Conn.
Sterling Memorial Library, same

Palmer Rogers, New York City
Northside High School, Corning
High School and Grade School, Addison
High School, Painted Post

Rossiter & Muller, New York City
Scarsdale High School, Scarsdale
Foxmeadow Grade School, Scarsdale
Addition to Greenburgh Grade School, District No. 6, Scarsdale

William L. Rouse, New York City
School and Settlement House, Federation Settlement House, New York City
School and Settlement House, The Madison House, New York City
Addition to Hebrew Technical Institute, New York City

J. M. Ryder, Schenectady
Scotia High School, Scotia
St. Johnsville High School, St. Johnsville
Stillwater High School, Stillwater

Salvati & LeQuornik, Brooklyn
St. Clare Parochial School, New York City
Our Lady of Mt. Carmel Parochial School, Mt. Vernon
Mary Help of Christians School, New York City

A. W. E. Schoenberg, Olean
Grammar Schools, Olean
Richburg High School, Richburg
Allegany High School, Allegany

Frederick J. Schwarz, New York City
St. Joseph's Roman Catholic School, Bayonne, N. J.
Holy Trinity School, Yonkers
Holy Rosary Roman Catholic School, Passaic, N. J.

Alexander Selkirk, Albany
Albany College of Pharmacy, Albany
Public Grade and High School, Delmar
Public Grade School No. 23, Albany

Albert M. Skinner, Watertown
Cooper School, Watertown
Washington and Lincoln Schools, Ogdensburg
Sacket Harbor High School, Sacket Harbor

Edward C. Smith, Poughkeepsie
Christopher Columbus Grade School (Public School No. 3), Poughkeepsie
Warring Grade School (Public School No. 10), Poughkeepsie
Grade and High School, Arlington

W. H. Spaulding, Jamaica
Grade School, Union Free School District No. 19, East Rockaway
Grade School, Union Free School District No. 16, Elmont
Grade School, Union Free School District No. 30, Valley Stream

Starrett & Van Vleck, New York City
White Plains High School, White Plains
Isaac E. Young Junior High School, New Rochelle
George Inness Junior High School, Montclair, N. J.

Philip Steigman, Brooklyn
Yeshiva D'Brooklyn (High School and College), Brooklyn
Yeshiva Torah Vo-Daath (High School and College), Brooklyn
Yeshiva Isaac Jacob Reiners (High School and College), Brooklyn

Herbert C. Swain, Buffalo
Parker High School, Clarence
Eden High School, Eden
Silver Springs High School, Silver Springs

Thompson, Holmes & Converse, New York City
New group of buildings, Hunter College of the City of New York, New York City
School of Business, College of the City of New York, New York City
Dalton High School, Dalton, Mass.

Edward Lippincott Tilton, New York City
Welch Medical Library, Johns Hopkins University, Baltimore, Md.
Library Building, University of Notre Dame, Notre Dame, Ind.
Library Building, Queens University, Kingston, Ontario, Canada

Tooker & Marsh, New York City
High School, Patchogue
High School, North Tonawanda
High School, Bellows Falls, Vt.

Wm. B. Tubby, New York City
Roslyn High School, Roslyn
Roslyn Grade School, Roslyn
Bedford Junior High School, Westport, Conn.

Hobart B. Upjohn, New York City
Group of eight buildings, North Carolina State College, Raleigh, N. C.
Group of five buildings, St. Catherine's School for Girls, Richmond, Va.
Junior-Senior High School, Roanoke Rapids, N. C.

E. P. Valkenburgh, Middletown
Albert Street Grade School, Middletown
Woodbourne Grade School, Woodbourne
South Fallsburg High School, South Fallsburg

W. Brown Van Dreser, Gloversville
New Junior High School, Gloversville
Speculator District School, Speculator
Wells District School, Wells

John V. Van Pelt, New York City
Gennadeion Library Group, American School of Classical Studies in Athens (Associate Architect)
School and Convent, Church of the Immaculate Conception, Tuckahoe
Orangeburg Grade School, Orangeburg

Theodore Visscher & James Burley, New York City
Alumni Administration Building, Lehigh University, Bethlehem, Pa.
Christmas-Saucon Hall, School of Business Administration, same
Science Building, Hampden-Sidney College, Hampden-Sidney, Va.

C. Edward Vosbury, Binghamton
Johnson City High School, Johnson City
Theodore Roosevelt School, Johnson City
Palm Harbor School, Clearwater, Fla.

J. Russell White, Albany
Grade and High School, Bolton Landing
Junior-Senior High School, Fort Edward
Grade and High School, Middleville

Frederic P. Wiedersum, Valley Stream
Union Free School, District No. 13, Valley Stream
Union Free School, District No. 24, Valley Stream
Valley Stream High School, District No. 1, Valley Stream

Philip Newell Youtz, New York City
American-Chinese Educational Commission, School for Boys, Canton, China
American Board of Commissioners for Foreign Missions, Loh Tak School for Girls, Canton, China
Union Normal School, Canton, China

NORTH CAROLINA

Harry Barton, Greensboro
Senior High School, High Point
Auditorium, North Carolina College for Women, Greensboro
Music Building, same

Benton & Benton, Wilson
Selma Public School, Selma
High School, Tarboro
Fremont Public School, Fremont

G. R. Berryman, Raleigh
East Carolina Teachers College, Greenville
High School, Greenville
Consolidated School, Edgecombe County

Percy Bloxam, Salisbury
Group of buildings, Catawba College, Salisbury
Seven schools, Rowan County
Two schools, Rutherfordton County

T. E. Davis, Asheville
Sand Hill High School
Oakley School
French Broad School

Douglas D. Ellington, Asheville
Senior High School, Asheville
Auditorium, Park Avenue School, Asheville
Central Service Plant, Municipal College, Asheville

Eric G. Flannagan, Henderson
Charles Aycock School, Vance County
Woodland-Olney School, Woodland
Williamston High School, Williamston

Q. E. Herman, Hickory
Balls Creek Consolidated School, Catawba County, Newton
Valdese High School, Valdese
Longview High School, Hickory

James W. Hopper, Leaksville
Wentworth High School, Wentworth
Stoneville High School, Stoneville
Bethany Consolidated School, Bethany

Herbert B. Hunter, High Point
New group of buildings, High Point College, High Point: Administration Building, Science Building, Boys' and Girls' Dormitories
New group of buildings, Elon College, Elon: Administration Building, Auditorium, Christian Education Building, Library Building, and Science Building
New group of eleven buildings (contract awarded for first two), Atlantic Christian College, Wilson

M. R. Marsh, Charlotte
Plaza Rosa School, Charlotte
Fairview Elementary School, Charlotte
Mt. Pleasant High School, Mt. Pleasant

James A. Salter, Raleigh
Franklin Public School, Franklin
Administration Building, Methodist Orphanage, Raleigh
West Raleigh School, Raleigh

C. Gadsden Sayre, Greensboro
Hugh Morson High School, Raleigh
Boyden High School, Salisbury
Hall Fletcher High School, Asheville

NORTH DAKOTA

Bugenhagen & Molander, Minot
Minot Junior High School, Minot
Velva State Agriculture High School, Velva
Rugby High School, Rugby

Jos. Bell DeRemer, Grand Forks
New Gymnasium and Classroom Unit, Central High School, Grand Forks
Liberal Arts Building, University of North Dakota, Grand Forks
St. Mary's Parochial School, Grand Forks

Gilbert R. Horton, Jamestown
Mandan High School, Mandan
Wimbledon Grade and High School, Wimbledon
Kulm Grade and High School, Kulm

Van Horn & Ritterbush, Bismarck
Roosevelt Grade School, Bismarck
Boys' Dormitory, State Training School, Mandan
Girls' Dormitory, State Training School, Mandan

OHIO

John Quincy Adams, Columbus
High and Junior High School, New Lexington
High School, Corning
Liberal Arts Building, College of St. Mary of the Springs, Columbus

John S. Adkins, Architect; **Hubert M. Garriott,** Associate Architect, Cincinnati
Riley Junior High School, Logansport, Ind.
Onward Consolidated School, Onward, Ind.
Denver Memorial Hall, Wilmington College, Wilmington

A. M. Allen & Co., Cleveland
Charles F. Brush High School, South Euclid
Maple Heights High School, Maple Heights
Southington Township School, Southington

Althouse & Jones, Mansfield
Mansfield Senior High School, Mansfield
Junior High School, Galion
Central Grade and High School, Leroy

Geo. W. Barkman, Hamilton
Three Grade Schools, Hamilton
High School, Harrison
Hanover Township Centralized School, Butler County

Paul Boucherle, Architect; **Walter J. Canfield,** Associate Architect, Youngstown
East High School, Youngstown
Rutherford B. Hayes Junior High School, Youngstown
Woodrow Wilson Junior High School, Youngstown

Jos. N. Bradford, University Architect, Columbus
Medical College Group, Ohio State University, Columbus
Education and Chemistry Buildings, same
Animal Husbandry Building, same

Gustave W. Drach, Inc., Cincinnati
Victoria Hall (Nurses' Training School), Good Samaritan Hospital, Cincinnati
Heberle School, Cincinnati
Gymnasium and Auditorium Building, St. Bernard School, St. Bernard

Fechheimer & Ihorst, Cincinnati
Roosevelt Public School, Cincinnati
Group of buildings, Hebrew Union College, Cincinnati
Public School, Mariemont (model town)

H. O. Fullerton, Cleveland
Mexico Grade and High School, Mexico, N. Y.
West Leyden Central School, West Leyden, N. Y.
Constableville Grade and High School, Constableville, N. Y.

Fulton & Taylor, Cleveland
Berea High School, Berea
Parma Junior High School, Parma
Garfield Heights High School, Garfield Heights

Garber & Woodward, Cincinnati
Western Hills Junior-Senior High School, Cincinnati
Mt. Logan Junior High School, Chillicothe
Marietta Junior-Senior High School, Marietta

Abram Garfield, Cleveland
Institute of Pathology, Western Reserve University, Cleveland
Music Building, Lake Erie College, Painesville
Science Building and Dormitory, Kenyon College, Gambier

Gebhart & Schaeffer, Dayton
Emerson Junior High School, Dayton
Jackson Elementary School, Dayton
Ruskin Elementary School, Dayton

Edwin M. Gee, Toledo
Jones Junior High School, Toledo
Woodward High School, Toledo
Harvard School, Toledo

J. Kerr Giffen, Canton
Cambridge Hall, Muskingum College, New Concord
Dennison Junior-Senior High School, Dennison
Walnut Creek Grade School, Walnut Creek

Harry Hake, Cincinnati
Electrical College, Cincinnati University, Cihcinnati
Law College, same
Administration Building, Lincoln Memorial University, Harrogate, Tenn.

Lawrence H. Hall, Springfield
Centralized High and Grade School, Pleasant Hill
Centralized High and Grade School, Jeffersonville
High School, Olive Branch, Clark County

Samuel Hannaford & Sons, Cincinnati
School for Crippled Children, Cincinnati
Gymnasium, Norwood High School, Norwood
Wyoming Grade and High School, Wyoming

Geo. M. Hopkinson, Cleveland
John Hay Commercial High School, Cleveland
Alexander Hamilton Junior High School, Cleveland
Charles Dickens Elementary School, Cleveland

Joseph C. Huber, Jr., Toledo
St. Stephen's Parish School, Toledo
Blessed Sacrament Parish School, Toledo
St. Ann's Parish School, Fremont

Keich, O'Brien & Hosker, Warren
Warren G. Harding High School, Warren
East Junior High School, Warren
West Junior High School, Warren

H. F. Kling & Son, Youngstown
N. H. Chaney Junior High School, Youngstown
Boardman High School, Boardman
Mineral Ridge Grade School, Mineral Ridge

M. M. Konarski, Akron
Spicer School, Akron
H. V. Hotchkiss School, Akron
Geo. T. Rankin School, Akron

Kunz & Beck, Inc., Cincinnati
Mt. St. Mary Seminary, North Norwood
St. Teresa School and Chapel, Cincinnati
St. Aloysius School, Elmwood Place

Langdon, Hohly & Gram, Toledo
Junior High School, Tiffin
"Marsh Foundation" Group, Van Wert: Main School Building, instructors' homes, cottages, power-plant, etc.
Addition to Swanton School, Swanton

M. P. Lauer, Akron
Highland Park Grade School, Kenmore
F. E. Smith School, Kenmore
W. F. Rimer School, Kenmore

The J. E. Lewis Co., Canton
Malvern High School, Malvern
Beach City High School, Beach City
West Lafayette High School, West Lafayette

Office of Charles J. Marr, New Philadelphia
Canal Fulton High School, Canal Fulton
East Sparta High School, East Sparta
Bolivar High School, Bolivar

Thomas D. McLaughlin & Associates, Lima
Notre Dame College, South Euclid
Middletown Schools, Middletown
Findlay Schools, Findlay

Miller & Reeves, Columbus
Bexley Elementary and Junior High School, Columbus
Upper Arlington School, Upper Arlington, Columbus (Howard Dwight Smith, Associate Architect)
St. Paul's Parish House Church School, Columbus

Frederick G. Mueller & Walter R. Hair, Hamilton
Catholic High School, Hamilton
St. Joseph's Parochial School, Hamilton
Junior High School, Hamilton

Peterson & Clarke, Steubenville
Grant Junior High School, Steubenville
Toronto High School, Toronto
Cross Creek District High School, Follansbee, W. Va.

F. J. Porter, Architect; **D. Roy Virtue**, Associate, Columbus
Rushcreek Memorial High School, Bremen
Piketon Rural High School, Piketon
Johnstown-Monroe Rural School, Johnstown

Potter-Gabele & Co., Cleveland
St. Cecilia's Parochial Grade School, Cleveland
St. Mary's Parochial Grade and High School, Massillon
Sacred Heart High School for Girls, E. Cleveland

Walter A. Rabold, Inc., Canton
Jefferson High School, R. R. No. 6, Dayton
Tuscarawas Grade and High School, Tuscarawas
Midvale High School, Midvale

Vernon Redding & Associates, Mansfield
Lincoln Junior High School, Canton
High School, Shelby
High School, Ashland

Richards, McCarty & Bulford, Columbus
South High School, Columbus
Four Marion Township schools, Franklin County
Columbus School for Girls, Columbus

T. Ralph Ridley, Akron
Wooster Senior and Junior High School, Wooster
Medina High School, Medina
Perkins Normal School, Akron

Riebel Sons & Matheny, Columbus
Groveport Grade and High School, Groveport
Crooksville High School, Crooksville
Reynoldsburg Grade and High School, Reynoldsburg

Anton Rieg, Cincinnati
St. George's Parochial School, Cincinnati
St. Joseph of Nazareth School, Cincinnati
St. Joseph's School, Cincinnati

Schenck & Williams, Dayton
Roosevelt High School, Dayton
Oakwood High School, Oakwood Village, Dayton
Oakwood Grade School, Oakwood Village, Dayton

Granville E. Scott, Norwalk
Community High School, Norwalk
High School, Willard
Washington High School, Utica

Howard Dwight Smith, Columbus
Stadium, Ohio State University, Columbus
Gymnasium and Field House, Wittenberg College, Springfield
One Senior High School, three Junior High Schools, and five Elementary Schools (for Board of Education), Columbus

Smull & Unger, Ada (also Bucyrus)
John H. Taft Gymnasium, Ohio Northern University, Ada
College of Law Building, same
Centralized High School, Zanesfield

Snyder & Babbitt, Architects and Engineers, Columbus
North High School, Columbus
Library and Assembly Hall, Indiana State Normal School, Muncie Training School, same

Jos. G. Steinkamp & Bro., Cincinnati
St. Xavier Library, St. Xavier College, Cincinnati
Field House, same
Auditorium and addition, Garfield School, Cincinnati

S. P. Stewart & Son, Bowling Green
Grade and High School, Woodville
Dormitory for Women, Bowling Green State Normal College, Bowling Green
Senior High School, Bowling Green

Tietig & Lee, Cincinnati
Addition to Hyde Park School, Cincinnati
Addition to Hughes High School, Cincinnati
The Sayler Park School, Cincinnati

Harry W. Wachter, Toledo
Fourth Ward School, Monroe, Mich.
Williamsburg School, Williamsburg, Mich.
Trinity Lutheran School, Toledo

Walker & Norwick, Dayton
Lincoln Junior High School, Dayton
Elementary and High School, North Baltimore
High School, Gibsonburg

Walker & Weeks, Cleveland
Group of five buildings, The University School (preparatory school for boys), Cleveland
Group of two buildings, The Hathaway-Brown School (preparatory school for girls), Cleveland
Group of eleven buildings, Greater Wesleyan College, Macon, Ga.

H. L. Wardner, Akron
Harmony School, Mingo Junction
Washington School, Canton
New Bedford High School, New Bedford, Mass.

Warner, McCornack & Mitchell, Cleveland
Group of buildings, University of Kentucky, Lexington, Ky.
Group of buildings (for Board of Education), Ashland, Ky.
Group of buildings (for Board of Education), Cleveland

Richard A. Zenk & Roy T. Campbell, Youngstown
Hubbard Grade School, Hubbard
Gustavus High and Grade School, Gustavus
Conneaut Grade School, Conneaut

OKLAHOMA

Jos. I. Davis, Oklahoma City
High School, Idabel
Eastern Oklahoma College Group, Wilburton
Girls' Dormitory, Oklahoma Baptist University, Shawnee

Chas. W. Dawson & A. E. Griffith, Muskogee
Gymnasium, Oklahoma School for the Blind, Muskogee
Dining Hall, Bacone College, Bacone (Dawson)
Parker Grade School, Fort Smith, Ark. (Dawson)

The Huseman Co., Chickasha
High School, Quay
High School, Tipton
High School, Hollister

Layton, Hicks & Forsyth, Oklahoma City
Library Building, University of Oklahoma, Norman
Capitol Hill Senior High School, Oklahoma City
Fine Arts Building, Oklahoma City University, Oklahoma City

A. J. Love & Co., Tulsa
High School, Wagoner
Barracks Building, Oklahoma Military Academy, Claremore
High School, Red Fork

Donald McCormick, Tulsa
Group of buildings, Cascia Hall, School of the Augustinian Fathers, Tulsa
School and Rectory, St. Francis Xavier Parish, Tulsa
Junior League Home and School for Convalescent Crippled Children, Tulsa

Albert S. Ross, Ada
Senior High School, Ada
Health Education Building, East Central State Teachers College, Ada
High School, Konowa

R. W. Shaw, Enid
Emerson Junior High School, Enid
Lincoln Elementary School, Enid
Gymnasium, Auditorium and Administration Building, Enid School System, Enid

Sorey & Vahlberg, Oklahoma City
Oklahoma Union Building, Oklahoma University, Norman
Library Building, Southeastern Teachers College, Durant
Gymnasium and Shops Building, Central High School, Oklahoma City

H. O. Valeur & Co., Muskogee
Junior High School, Muskogee
Grade School, Stone Bluff
Negro High School, Muskogee

OREGON

C. N. Freeman, Portland
Dallas High School, Dallas
Washington Grade School, Vancouver, Wash.
Union High School, District No. 1, Benton County

Joseph Jacobberger & Alf. H. Smith, Portland
Gymnasium Building, Columbia University, Portland
Chapel, Holy Name Convent, Seattle, Wash.
Rose City Park Grammar School, Portland

Knighton & Howell, Portland
Group of buildings, U. S. Grant High School, Portland
Junior High School, Salem
State Training School for Teachers, Independence

Lawrence, Holford, Allyn & Bean, Portland
Campus layout, University of Oregon, Eugene: Women's Building, Science Building, Commerce Building, Basket-Ball Pavilion, Dormitories, etc.
Laboratory Building and Children's Hospital, University of Oregon Medical School, Portland
Conservatory of Music and Dormitories, Whitman College, Walla Walla, Wash.

F. Marion Stokes, Portland
Milwaukie Union High School, Milwaukie
Ridgefield Combination Grade and High School, Ridgefield, Wash.
Battle Ground Union High School, Battle Ground, Wash.

Sutton & Whitney, Architects; **Earl N. Dugan,** Associate Architect, Portland (also Tacoma, Wash.)
Jones Hall, College of Puget Sound, Tacoma, Wash.
Science Hall, same
Annie Wright Seminary, Tacoma

Thomas & Mercier, Portland
Memorial Union Building, Oregon State College, Corvallis
Rainier High School, Rainier
Union High School, Redmond

Tourtellotte & Hummel, Portland
High School, Boise, Idaho
High School, Medford
Normal Grade and Training School, Ashland

J. E. Wicks, Astoria
Captain Robert Gray Junior High School, Astoria
John Jacob Astor Junior High School, Astoria
Liberty Hall Astoria High School, Astoria

PENNSYLVANIA

Alden, Harlow & Jones, Pittsburgh
South Hills High School, Pittsburgh
Johnston School, Wilkinsburg
Allison School, Wilkinsburg

The Ballinger Co., Philadelphia
Public Grade School, Woodbury, N. J.
Addition to Junior High and Grade School, Marcus Hook
Alpha Sigma Phi Fraternity House, State College

P. A. Bartholomew, Pittsburgh
Conneaut Junior High School, Conneaut, Ohio
Derry Township High School, West Derry
Salina High School, Salina

The Office of George C. Baum, Philadelphia
New group of buildings, Gettysburg College, Gettysburg
New group of buildings, The Lutheran Orphans' Home of the South, Salem, Va.
Denhart Hall, Carthage College, Carthage, Ill.

Francis A. Berner, Pittsburgh
Grade School, Reserve Township, Allegheny County
Phi Gamma Fraternity House, Washington
Holy Name Parish School, Pittsburgh

Boyd, Abel & Gugert, Philadelphia
Auditorium and Gymnasium, Senior High School, Haverford Township
Junior High School, Haverford Township
Rosemont Grammar School and Auditorium, Radnor Township

Brenot & Hicks, Erie
School, Guys Mills
School, Cranberry Township
School, Harborcreek

Irwin T. Catharine, Philadelphia
Overbrook High School, Philadelphia
Group of two buildings: Simon Gratz Senior High School and Gillespie Junior High School, Philadelphia
Woodrow Wilson Elementary School and Theodore Roosevelt Elementary School, Pensauken, N. J.

Clepper & Clepper, Architects and Engineers, Sharon
Sharon Junior-Senior High School, Sharon
Wengler Avenue Grade School, Sharon
Sharpsville High School, Sharpsville

Cody & Kirby, Erie
West Millcreek High School, Erie County
Lawrence Park Grade and High School, Erie County
Lakewood Grade School, Erie County

Conrad C. Compton, Donora
Ludwick Grade School, Greensburg
Rostraven Township Junior High School, Pricedale
Castner Grade School, Donora

W. Holmes Crosby & Co., Oil City
Elizabeth Crawford School, Emlenton
Rouseville Public School, Rouseville
Third Ward Public School, Franklin

Office of J. A. Dempwolf, York
Shippensburg High School, Shippensburg
Bachman Memorial Parochial School, New Cumberland
St. John's Parochial School, York

Press C. Dowler, Pittsburgh
Sewickley High School, Sewickley
Hormont High School, Pittsburgh
Etna High School, Etna

W. G. Eckles Co., New Castle
Senior High School, Butler
Group of buildings, Grove City College, Grove City
R. A. Browne Dormitory, Westminster College, New Wilmington

Folsom, Stanton & Graham, Philadelphia
High School, Collingdale
Philip Baker School, Wildwood Crest, N. J.
Primary and Junior High School, Sharon Hill

Fred A. Fuller, Erie (formerly Fuller & Stickle)
Fairview High School, Fairview
Group of buildings, St. John Kanty College, Erie: Dining Hall, Dormitories and Chapel
Group of buildings, Hannon Hall Boarding School, Erie: Chapel, Dormitories and Classrooms

J. C. Fulton & Son, Uniontown
Religious Educational Building and Community Center, Sarah Jane Johnson Memorial Methodist Episcopal Church, Binghamton, N. Y.
Religious and Departmental Educational Building and Social Center, Trinity Reformed Church, Akron, Ohio
Departmental Educational Building, First Lutheran Church, Johnstown

John B. Hamme, York
Group of eight buildings, Hood College, Frederick, Md.
William Penn Senior High School, York
Junior-Senior High School, Brunswick, Md.

Hasness & Albright, Harrisburg
High School and W. H. Ramsey Grade School, Stroudsburg
W. W. Rupert Memorial Grade School, Pottstown
High School, Spring City

Heacock & Hokanson, Philadelphia
Lansdowne High School, Lansdowne
Gymnasium, Auditorium and Kindergarten, Germantown Preparative Meeting, Germantown, Philadelphia
Highland Grade School, Abington Township

Hersh & Shollar, Altoona
Altoona Senior High School Annex, Altoona
Keith Junior High School, Altoona
Ashland High School, Ashland

Hoffman-Henon Co., Philadelphia
La Salle College Group, Philadelphia
West Philadelphia Catholic High School for Girls, Philadelphia
North East Catholic High School for Boys, Philadelphia

R. G. Howard, Du Bois
Clearfield High School, Clearfield
Johnsonburg High School, Johnsonburg
Homer City High School, Homer City

Norman Hulme, Philadelphia
Philadelphia College of Pharmacy and Science, Philadelphia
Women's Homeopathic Hospital and Nurses' Training School, Philadelphia
Sharon Hill Public School, Sharon Hill

Hunter & Caldwell, Altoona
Fairview Grade School, Altoona
Gaysport School, Hollidaysburg
Consolidated School, Alexandria

Ingham & Boyd, Pittsburgh
Training School for Teachers, Board of Education, Pittsburgh
Administration Building, same
Group of buildings, Shady Side Academy, Pittsburgh: Dining Hall, Dormitory and Gymnasium

Jacoby & Everett, Allentown
Dormitories and power-plant, Cedar Crest College, Allentown
Harrison and Morton High School, Allentown
High School, Nurses' College and Hospital, Sacred Heart Diocese, Allentown

Janssen & Cocken, Pittsburgh
Hygeia Hall, College of Wooster, Wooster, Ohio
School, Annunciation Parish, Pittsburgh
Alumni Hall, University of Pittsburgh, Pittsburgh

Emil R. Johnson & Clarence F. Wilson, Uniontown
Lafayette Junior High School, Uniontown
Chas. E. Boyle Elementary School, Uniontown
South Brownsville Senior High School, South Brownsville

Karcher & Smith, Philadelphia
Hicks Hall (engineering building), Swarthmore College, Swarthmore
Worth Hall and Girls' Dormitories, same
Women's Fraternity Lodges and Bond Memorial Building, same

Lawrie & Green, Harrisburg
Senior High School, Hazleton
High School, New Cumberland
State Teachers College, Gymnasium Building, Indiana

Edward B. Lee, Pittsburgh
Morgantown High School, Morgantown, W. Va.
Clifford B. Connelley Trade School, Pittsburgh
Washington High School, Washington

W. H. Lee, Philadelphia
Temple University College Building, Philadelphia
Temple University Medical School, Philadelphia
Palmerton High School, Palmerton

C. Howard Lloyd, Harrisburg
William Penn High School Group, Harrisburg
Auditorium and Gymnasium, High School, Steelton
Steele Grade School, Harrisburg

Ludlow & Schwab, Architects; **C. J. Palmgreen**, Associate Architect
Langley High School, Pittsburgh
Versailles Boro School, Versailles
Sumac Street School, McKeesport

Magaziner, Eberhard & Harris, Philadelphia
Arter Hall, Allegheny College, Meadville
Murphy College Group, Sevierville, Tenn.: Administration Building, Recitation Hall, Boys' and Girls' Dormitories and Chapel
East Maine Conference Seminary, Bucksport, Me.

Mellor, Meigs & Howe, Philadelphia
Auditorium and Music Wing, Bryn Mawr College, Bryn Mawr
Science Hall, Haverford College, Haverford
Gymnasium, Pennsylvania Institute for the Deaf, Mount Airy, Philadelphia

Meyers & Johnson, Architects and Engineers, Erie
Wilson Junior High School, Erie
Rice Avenue Union High School, Girard
Harding Elementary School, Erie

Wm. M. Michler, Easton
Easton Senior High School, Easton
Schull Junior High School, Easton
Porter Grade School, Easton

C. R. Moffitt, McKeesport
Walnut Street School, Archer Street School and Market Street School, McKeesport
Hebrew Institute, McKeesport
Sacred Heart School, McKeesport

Muhlenberg Bros., Reading
Tyson Schoener Grade School, Reading
Cressona High School, Cressona
Albright College Group of new buildings, Reading

Frederick A. Muhlenberg, Reading
High School, Shillington
Four Grade Schools, Reading
Grade School, Hamburg

Emile G. Perrot, Philadelphia (also New York City)
Library, Fordham University, Fordham, N. Y.
Notre Dame Academy, Moylan
Academy of the Sisters of the Order of St. Dominic, Newburgh, N. Y.

John H. Phillips, Pittsburgh
Miles Bryan High School, McKees Rocks
Margaret Bell Miller School, Waynesburg
Harbrac Union High School, Brackenridge

Alexander I. Prawdzik, Scranton
St. Stanislaus Orphanage Group, Sheatown (near Nanticoke)
Visitation of Blessed Virgin Mary Parochial School, Dickson City
Sacred Heart Parochial School, Scranton

Price & Walton, Philadelphia
Philips Memorial Building, State Teachers College, West Chester
Friends School, Atlahtic City, N. J.
Dormitory for Girls, Oak Grove Seminary, Vassalboro, Me.

Henry L. Reinhold, Jr., Philadelphia
Academy of the New Church, Bryn Athyns
High School, Windber
High School, Phoenixville

Ritcher & Eiler, Reading
Senior High School, Reading
Hegins Township School, Valley View
Cochran Grade School, Williamsport

Ritter & Shay, Philadelphia
Huntington High School, Huntington, W. Va.
Liberty High School, Bethlehem
David Rittenhouse Junior High School, Norristown

Ruhe & Lange, Allentown
Library, Muhlenberg College, Allentown
Science Building, same
Central Junior High School, Allentown

Scholl & Richardson, Reading
Southern Junior High School, Reading
Annville High School, Annville
Thorndale School, Downingtown

Henry Y. Shaub, Lancaster
George Ross Grade School, Lancaster
Manheim High School
West Lampeter Vocational High School, Lampeter

Simon & Simon, Philadelphia
Swedesboro High School, Swedesboro, N. J.
Haddonfield High School, Haddonfield, N. J.
Curtis Hall (engineering school), Drexel Institute, Philadelphia

H. Rex Stackhouse & W. W. Donohoe, Philadelphia
North Wildwood High School, North Wildwood, N. J.
A. V. Wood Gymnasium, Brunswick, Ga.
Middle Township High School, Cape May Court House, N. J.

James T. Steen & Sons, Pittsburgh
David B. Oliver Junior-Senior High School, Pittsburgh
Herron Hill Junior High School, Pittsburgh
Blaw-Knox Grade School, Blaw-Knox

Louis Stevens, Pittsburgh
Chatham Elementary School, Pittsburgh
Grade School, Overbrook, Allegheny County
Dormitory, Polk State School, Polk

Stewardson & Page, Philadelphia
Laboratory of Anatomy and Physiological Chemistry, University of Pennsylvania, Philadelphia
Dormitories, same
Dormitory, Haverford College, Haverford

G. W. Stickle, Erie
New group of buildings, Gannon Hall Boarding School, Erie
New building, St. John Kanty College, Erie
New group of buildings, St. Mary's College, North East

Albert L. Thayer, New Castle
Old Main Memorial, Westminster College, New Wilmington
George Washington Junior High School, New Castle
Lehman High School, Canton, Ohio

Horace Trumbauer, Philadelphia
Two new groups, Duke University, Durham, N. C.
Irvine Auditorium, University of Pennsylvania, Philadelphia
Ogontz School for Girls, Rydal

Van's Engineering Service (Henry M. Rogers, Architect), Blairsville
Ebensburg High School, Ebensburg
Washington Township High School, Apollo
Washington Township Grade School, Apollo

Frank R. Watson, Edkins & Thompson, Philadelphia
Group of buildings, Ursinus College, Collegeville: Dormitory Group, Gymnasium and Dining Hall
Dover High School, Dover, Del.
Oaklyn Public School, Oaklyn, N. J.

Ralph E. White, Philadelphia
Bryn Mawr Grade School, Bryn Mawr
Wynnewood Road Grade School, Wynnewood
Additions to Senior High School, Ardmore

W. Ward Williams, Pittsburgh
Junior High School, Ambridge
Grade School, Baden
Addition to High School, Pitcairn

RHODE ISLAND

Walter F. Fontaine, Woonsocket
Woonsocket Junior High School, Woonsocket
College of Mount St. Charles, Woonsocket
St. Anthony's School, New Bedford, Mass.

Joseph A. Hickey, Providence
Sons of Zion (special), Providence
Fairchild (elementary), Miami, Fla.
Veledrome (gymnasium), Hartford, Conn.

Howe & Church, Providence
Dormitory, St. George's School, Middletown
Junior High School, Bristol
Gymnasium, Brown University, Providence

Monahan & Meikle, Pawtucket
Senior High School, Pawtucket
Samuel Slater Junior High School, Pawtucket
Joseph Jenks Junior High School, Pawtucket

William R. Walker & Son, Providence
Senior High School, Cranston
Rhode Island College of Education, Providence
Junior High School, East Providence

SOUTH CAROLINA

F. H. & J. G. Cunningham, Greenville
Brevard High School, Brevard, N. C.
Stone School, Greenville
Woodruff High School, Woodruff

H. D. Harrall, Bennettsville
Elementary School, Dillon
High School, Latta
Gymnasium, Elementary Colored School, Bennettsville

J. Carroll Johnson, Columbia
Group of buildings, University of South Carolina, Columbia: Sloan College, Field House, Melton Memorial Observation; additions to and restoration of Library
Three Schools, Lancaster, S. C.

Lafaye & Lafaye, Columbia
Columbia College, Columbia
Shandon School, Columbia
High School, Summerville

Rudolph E. Lee, Clemson College
Women's Dormitory, University of South Carolina, Columbia
Girls' Dormitory, Lander College, Greenwood
Engineering Building, Clemson Agricultural and Mechanical College, Clemson College

J. D. Newcomer, Charleston
St. Paul's High School, St. Paul Parish, Charleston County
Ridgeland High School, Ridgeland
Rosemont School, Rosemont

J. E. Sirrine & Co., Greenville
Dormitory, Furman University, Greenville
Dining Hall, same
Athletic Building, same

James B. Urquhart, Columbia
Senior High School, Columbia
Junior High School, Columbia
Beaufort High School, Beaufort

W. Paul Williams, Spartanburg
High School, Duncan
High School, Inman
Colored Grammar School, Spartanburg.

Chas. C. Wilson, Columbia
Entire group of buildings, Meredith College, Raleigh, N. C.
New group of buildings, Limestone College, Gaffney
Model Grammar School, Spartanburg

SOUTH DAKOTA

Walter J. Dixon, Mitchell
Tyndall High School, Tyndall
Auditorium, Yankton High School, Yankton
Kimball Grade and High School, Kimball

Geo. F. Fossum, Aberdeen
College Hall, Spearfish Normal School, Spearfish
Simmons Elementary School, Aberdeen
High School, Hecla

Hugill & Blatherwick, Sioux Falls
Gymnasium and Armory Building, University of South Dakota, Vermilion
High School, Pierre
High School, Salem

F. C. W. Kuehn, Huron
Artesian Public School, Artesian
Jefferson Grade School, Huron
Wilson Grade School, Huron

Perkins & McWayne, Sioux Falls
Library, State College of Agriculture and Mechanic Arts, Brookings
Auditorium, University of South Dakota, Vermilion
Washington High School, Sioux Falls

TENNESSEE

Alsop & Callanan, Memphis
Hulbert Separate School District, Hulbert, Ark.
Tuscumbia High School, Tuscumbia, Ala.
Rolling Fork Consolidated School, Rolling Fork, Miss.

George Awsumb, Memphis (successor to Pfeil & Awsumb)
South Side High School, Memphis
L. C. Humes High School, Memphis
Hernando Consolidated Grade and High School, Hernando, Miss.

Baumann & Baumann, Knoxville
Maynard School, Knoxville
Austin High School, Knoxville
Park High School, Knoxville

Bearden & Crutchfield, Chattanooga
Dixie Portland Memorial School, Richard City
East Lake Junior High School, Chattanooga
Park Place Grammar School, Chattanooga

Colle & Cardwell, Johnson City
North Side School, Johnson City
Crescent Grammar School, Greeneville
Gymnasium, Tusculum College, Tusculum

Allen N. Dryden, Kingsport
Dobyns-Bennett High School, Kingsport
High School, Gate City, Va.
Church School, Rogersville

R. H. Hunt Co., Chattanooga (also Dallas, Texas)
McFarlin Memorial Auditorium, Southern Methodist University, Dallas, Texas
High School, Huntsville, Ala.
Training School, East Tennessee State Teachers College, Johnson City

Manley & Young, Knoxville
Administration Building, Tennessee Wesleyan College, Athens
Monroe County High School, Sweetwater
Harriman High School, Harriman

M. E. Parmelee, Knoxville
Gymnasium, Mars Hill College, Mars Hill, N. C.
Melrose Dormitory, same
Brown Dormitory, same

Gordon L. Smith, Chattanooga
Joseph E. Smith Elementary School, Chattanooga
Addition to Dickinson Junior High School, Chattanooga
Recreation Building, McCallie School, Chattanooga

Geo. D. Waller, Nashville
Group of three buildings, Montgomery Bell Academy, Nashville
Two Elementary Schools, Davidson County
Jones Avenue Elementary School, Nashville

TEXAS

Ralph H. Cameron, San Antonio
Main Avenue High School, San Antonio
McAllen High School, McAllen
Luling Public School, Luling

Lamar Q. Cato, Houston
George Washington Junior High School, Houston
Stonewall Jackson Junior High School, Houston
Woodrow Wilson Elementary School, Houston

Curtis & Thomas, Dallas
High School, Carthage
Second Ward School, Paris
East Paris School, Paris

DeWitt & Washburn, Dallas
Woodrow Wilson High School, Dallas (Associate Architects)
Sunset High School, Dallas (Associate Architects)
School of Theology, Southern Methodist University, Dallas (Associate Architects)

Leo M. J. Dielmann, San Antonio
Holy Ghost Convent, San Antonio
Manual Arts High School, Yoakum
Immaculate Heart of Mary School, San Antonio

T. J. Galbraith, Dallas
Hillsboro High School and Junior College, Hillsboro
Stephen J. Hay Elementary School, Dallas
Shawnee Park Elementary School, Graham

Giesecke & Harris, Houston
New group of buildings, Primary-Junior High School —Senior High School and Junior College, Edinburg
New unit, Senior High School, Austin
High School, Brenham

Herbert M. Greene, LaRoche & Dahl, Dallas
Scottish Rite Dormitory, University of Texas, Austin
New group of nine buildings, same
Laboratory, Medical College, Galveston

Hardy & Curran, Corpus Christi
Corpus Christi Senior High School, Corpus Christi
Del Mar Grade School, Corpus Christi
Mexican Grade School, Corpus Christi

Wyatt C. Hedrick, Inc., Fort Worth
Texas Technical College Group, Lubbock: Administration Building, Chemistry Building, Engineering Building (Wm. Ward Watkin, Houston, Associate Architect)

Henry Norton June, Corpus Christi
Group of buildings, Agricultural and Mechanical College of Texas, College Station: three Dining Halls, Law and Puryear Halls (dormitories) and Athletic Stadium

H. F. Kuehne, Austin
Llano High School, Llano
Group of seventeen buildings, Austin State School, Austin
Smithville High School, Smithville

C. H. Leinbach, Dallas
Atlanta High School, Atlanta
Two Elementary Schools, Mexia
Wilmer Hutchins High School, Dallas

Mark Lemmon, Dallas
Thomas Jefferson Junior High School, Port Arthur
Woodrow Wilson High School, Dallas (Associate Architect)
Sunset High School, Dallas (Associate Architect)

Livesay & Wiedemann, Beaumont
Daisetta High School, Daisetta
Beaumont Public Schools, Beaumont
South Park School (Giles School), Beaumont

John McLelland, Houston
Park Junior High School, Houston
Clinton High School, Houston
Pasadena High School, Houston

Jos. W. Northrop, Jr., Houston
Educational Building, First Evangelical Church, Houston
Group of buildings, Trinity Episcopal Church, Marshall
Educational Building, Christ Evangelical Church, Houston

Page Bros., Austin
Two Junior High Schools, Beaumont
High School, Georgetown
Administration Building, North Texas State Teachers' College, Denton

Harry D. Payne, Houston
School Building Program, Houston Independent School District (Supervising Architect)
Baytown Junior High School, Baytown
Robert E. Lee High School, Goose Creek

Peters, Haynes & Strange, Lubbock
High School, Lubbock
High School, Lamesa
High School, Odessa

Phelps & Dewees, San Antonio
Eight Junior High Schools, San Antonio
San Angelo Junior College, San Angelo
Brownsville High School, Brownsville

E. F. Rittenberry & Co., Amarillo
Education Building, West Texas State Teachers College, Canyon
Hereford High School, Hereford
Seven Grade and Senior High Schools, Amarillo

Milton W. Scott & Co., Waco
South Waco Junior High School, Waco
Group of four buildings, State Home for Dependent and Neglected Children, Waco
Gymnasium, High School, Waco

Paul G. Silber & Co., San Antonio
Educational Building, First Presbyterian Church, San Antonio
Administration Building, Clifton College, Clifton
High School, Alice

Harvey P. Smith, San Antonio
Alamo Heights Elementary and Junior High School, Alamo Heights, San Antonio
San Benito High School, San Benito
Dormitory, Lutheran Concordia College, Austin

Maurice J. Sullivan, Houston
Villa de Matel, School for Novices, Houston
Jas. S. Hogg Junior High School, Houston (with B. P. Briscoe)
Jefferson Davis High School, Houston (with B. P. Briscoe)

Voelcker & Dixon, Wichita Falls
Zundelowitz Junior High School, Wichita Falls
High School, Olney
High School, Henrietta

Wm. Ward Watkin, Houston
Laboratory of Chemistry, Rice Institute, Houston
Six Junior and Senior High Schools, Houston
Texas Technological College Group, Lubbock

UTAH

Cannon & Fetzer, Salt Lake City
West High School, Salt Lake City
Grantsville High School, Grantsville
Central Building, University of Utah, Salt Lake City

Joseph Nelson, Provo
Nephi High School, Nephi
Heber J. Grant Library, Brigham Young University, Provo
Provo High School, Provo

Eber F. Piers, Ogden
Central Junior High School, Ogden
St. Joseph's Parochial School, Ogden
West Weber Grade School, Ogden

Scott & Welch, Salt Lake City
Bryant Junior High School, Salt Lake City
Sandy Junior High School, Sandy
Central School, Nampa, Idaho

VERMONT

Frank Lyman Austin, Burlington
Cathedral High School and Gymnasium, Burlington
Junior High School, Burlington
Winooski High School, Winooski

Arthur H. Smith, Rutland
Administration Building, State Normal Training School, Castleton
Girls' Dormitory, same
Gymnasium, Burr and Burton Seminary, Manchester

VIRGINIA

Carneal & Johnston, Richmond
New buildings, Virginia Polytechnic Institute, Blacksburg
New buildings, Virginia Military Institute, Lexington
Blackstone Military Academy, Blackstone

T. J. Collins & Son, Staunton
Memorial Hall, Staunton Military Academy, Staunton
Complete School Group, Fishburne Military School, Waynesboro
Gymnasium and Academic Group, Augusta Military Academy, Fort Defiance

Clarence B. Kearfott, Bristol
New group of buildings, Arlington Hall (School for Girls), Arlington County
Science Hall and Literary Group, Virginia Intermont College, Bristol
Appalachia High School, Appalachia

Peebles & Ferguson, Norfolk
Ruffuer Junior High School, Norfolk
Phi Beta Kappa Memorial Hall, College of William and Mary, Williamsburg
Two Grammar Schools, Norfolk

Charles M. Robinson, Richmond
Harrisonburg High School, Harrisonburg
Richmond Normal School, Richmond
Wm. Barton Rogers Memorial Science Hall, College of William and Mary, Williamsburg

Louis Philippe Smithey, Roanoke
Wasena School, Roanoke
Addition to Jackson Junior High School, Roanoke
Addition to National Business College, Roanoke

WASHINGTON

Baker, Vogel & Roush, Architects and Engineers, Seattle
Washington High School, Pasco
American Methodist Episcopal Japanese Girls High School, Nagasaki, Japan
Lutheran Japanese Girls High School, Kumamoto, Japan

Bebb & Gould, Seattle
Eleven Academic Buildings and Library, University of Washington, Seattle
Washington State Normal School Group and Library, Bellingham
St. Nicholas Private School for Girls, Seattle

Chas. I. Carpenter, Spokane
New group of buildings, Ellensburg State Normal School, Ellensburg: Dormitories, Dining Hall, Library and Gymnasium

Wm. W. deVeaux, Yakima
Madison Grade School, Yakima
Selah High School, Selah
Addition to Garfield Grade School, Yakima

John Graham, Seattle
Sacred Heart School, Seattle
Physics Building, University of Washington, Seattle
St. Mary's Academy, Centralia

Hill & Mock, Tacoma
Morton McCarver Intermediate High School, Tacoma
Reconstruction of Puyallup High School and addition to Junior High School, Puyallup
Sumner Grade School and central heating plant, Sumner

C. Frank Mahon, Seattle
St. Mary's Catholic Parochial School, Aberdeen
Immaculate Conception Catholic Parochial School, Everett
Perpetual Help Catholic Parochial School, Everett

Wm. Mallis, Seattle
Yahoma High School, Maple Valley
Auburn High School, Auburn
Kent High School, Kent

Maloney & Bockerman, Yakima
Franklin Junior High School, Yakima
Sunnyside Grade School, Sunnyside
St. Patrick's Parish School, Walla Walla

F. A. Naramore, Seattle
Bryant Elementary School, Seattle
Alexander Hamilton Intermediate School, Seattle
Grover Cleveland Intermediate and Junior High School, Seattle

George M. Rasque, Spokane
Coeur d'Alene Junior High School, Coeur d'Alene, Idaho
Odessa High School, Odessa
Colville High School, Colville

Francis P. Rooney, Spokane
House of the Good Shepherd, Spokane
St. John's Academy, Colefax
Kellogg High School, Kellogg, Idaho

Stanley A. Smith, College Architect, Pullman
Group of buildings, State College of Washington, Pullman: The Commons, Men's Gymnasium and Home Economics Building

Whitehouse & Price, Spokane
West Valley High School, Millwood
Arlington Grade School, Hillyard, Spokane
Russell Grade School, Moscow, Idaho

Jos. H. Wohleb, Olympia
Lincoln Grade School, Olympia
Irene S. Reed High School, Shelton
William Winlock Miller High School, Olympia

Arnott Woodroofe, Spokane
Gymnasium, Fairfield High School, Fairfield
Grade School, District No. 98, Pierce County
Roy High School, Roy

WEST VIRGINIA

William Francis Diehl, Huntington
Douglas Senior and Junior High School, Huntington
Grant High School, Grant District, Cabell County, Milton
Gymnasium and Physics Education Building, Morris Harvey College, Barboursville

S. W. Ford, Clarksburg
Mannington High School, Mannington
Bridgeport High School, Bridgeport
Eagle District High School, Lumberport

Frampton & Bowers, Huntington
Elkins High School, Elkins
Oak Hill High School, Oak Hill
Martinsburg High School, Martinsburg

Edward Bates Franzheim, Wheeling
Warwood High School, Wheeling
Chemistry Building, Bethany College, Bethany
Colored Grade School, Triadelphia

Garry & Sheffey, Bluefield
Ramsey Junior High School, Bluefield
Fairview Junior High School, Bluefield
Mullens High School, Mullens

Carl Reger, Morgantown
Upshur County High School, Buckhannon
Reno District High School, Rowlesburg
Agnes Howard Hall, West Virginia Wesleyan College, Buckhannon

Warne, Tucker, Silling & Hutchison, Charleston
Charleston Senior High School, Charleston
Woodrow Wilson Junior High School, Charleston
Administration Building, West Virginia Collegiate Institute, Institute

Edward J. Wood & Son, Clarksburg
Sutton High School, Sutton
Weston Grade School, Weston
Despard School, Clarksburg

WISCONSIN

Auler, Jansen & Brown, Oshkosh
Oshkosh Vocational and Recreation Building, Oshkosh
Roosevelt Junior High School, Oshkosh
Ripon Primary School, Oshkosh

N. P. Backes, Milwaukee
St. Elisabeth School, Milwaukee
Holy Cross School, Milwaukee
St. John's School, Marshfield

Balch & Lippert, Madison
Winnebago Indian School, Neillsville
Mazomanie High and Grade School, Mazomanie
Religious Educational Building, Swiss Reformed Church, New Glarus

Peter Brust, Milwaukee
Alvernia High School, Chicago, Ill.
Mercy High School, Milwaukee
Ernest G. Miller Gymnasium, St. Francis Seminary, St. Francis

Foeller, Shober & Berners, Green Bay
East Side High School, Green Bay
Nicolet High School, West De Pere
West Bend High School, West Bend

Herbst & Kuenzli, Milwaukee
Mount Mary College Group, Milwaukee
Wauwatosa High School Group, Wauwatosa
Shorewood High School Group, Shorewood

Ferd. L. Kronenberg, Madison
Addition to Emerson School, Madison
St. Peter's School, Beaver Dam
St. Xavier School, Cross Plains

E. R. Liebert, Milwaukee
Grade School, Zoar Congregation, Milwaukee
Grade School, District No. 5, Custer, Mich.
Concordia College, Milwaukee

Merman & Skogstad, La Crosse
La Crosse Vocational School, La Crosse
Beloit Vocational School, Beloit
Lincoln Junior High School, La Crosse

Oppenhamer & Obel, Green Bay
Central School, Wausau
High School, Burlington
High School, Sheboygan Falls

Parkinson & Dockendorff, La Crosse
Purdy Junior High School, Marshfield
Junior High School, Waukesha
Catholic Central High School, La Crosse

Mark F. Pfaller, Milwaukee
St. Agnes Church and School Building, Milwaukee
Blessed Sacrament Church and School Building, Milwaukee
St. Dominic's School, Sheboygan

Charles Clark Reynolds, Green Bay
West Senior High School, Green Bay
Butte Des Morts Elementary School, Menasha
Irwin Elementary School, De Pere

Alvan E. Small, Madison
Lowell Grade School, Madison
Randall Grade School, Madison
Nakoma Grade School, Madison

Smith & Brandt, Manitowoc
Kiel Grade and High School, Kiel
Marion Grade and High School, Marion
Cunningham Elementary School, Beloit

Frank J. Stepnoski, Fond du Lac
St. Peter's Lutheran School, Fond du Lac
St. John's Catholic School, Little Chute
Holy Name Catholic School, Kimberly

Edward Tough, Madison
Mineral Point High School, Mineral Point
Randall Junior High School, Madison
Dudgeon Grade School, Madison

Martin Tullgren & Sons, Milwaukee
West Milwaukee High School, West Milwaukee
Humboldt Avenue Public School, Whitefish Bay
Hampton Road Public School, Whitefish Bay

Van Ryn & De Gelleke, Milwaukee
Central Vocational School, Milwaukee
Milwaukee University School, Milwaukee
Science Hall, Milwaukee-Downer College, Milwaukee

Carl Volkman, Eau Claire
High School, Bloomer
Public School, Eau Claire
Parochial School, Chippewa Falls

Guy E. Wiley, Milwaukee
Koscinszko Prevocational School, Milwaukee
Geo. H. Walker Junior High School, Milwaukee
Lincoln High School, Milwaukee

WYOMING

Wilbur A. Hitchcock, Laramie
Library, University of Wyoming, Laramie
Laramie High School, Laramie
Men's Dormitory, University of Wyoming, Laramie

CANADA

ALBERTA

W. A. Branton, Calgary
Crescent Heights High School, Calgary
Western Canada High School, Calgary
Western Canada Technical High School, Calgary

Edward Underwood, Edmonton
St. Joseph's Catholic College, Edmonton
St. John's Juniorate of O.M.I., Edmonton
St. Alphonsus R. C. Separate School, Edmonton

BRITISH COLUMBIA

Bowman & Cullerne, Vancouver
Norquay School, Vancouver
Chilliwack City School, Chilliwack
Gilmore Avenue School, Burnaby

Harry W. Postle, Architect to Vancouver Board of School Trustees, Vancouver
Vancouver Technical High School, Vancouver
(Administration and academic building; auditorium and power-house; workshops and gymnasium)

Sharp & Thompson, Vancouver
University of British Columbia group, Vancouver: Science and library group; Anglican Theological College
Templeton Junior High School, Vancouver

MARITIME PROVINCES

Major H. E. Gates, Halifax, N. S.
Pathological Institute, Halifax, N. S.
Victoria General Hospital and Medical School of Dalhousie University (for instruction jointly), Halifax, N. S.

ONTARIO

William C. Beattie, Ottawa
York Street Public School, Ottawa
Public School, Cornwall
Aylmer High School, Aylmer, Que.

John R. Boyde, Windsor
Walkerville High School, Walkerville
Brescia Hall, Western University, London
St. Peter's Seminary, London

D. J. Cameron & W. Ralston, Windsor
Windsor-Walkerville Technical School, Windsor
Galt Collegiate Institute, Galt
Kennedy Collegiate, Windsor

S. B. Coon & Son, Toronto
St. Catharines Collegiate and Vocational School, St. Catharines
Kitchener & Waterloo Collegiate and Vocational School, Kitchener
Sarnia Collegiate and Vocational School, Sarnia

Darling & Pearson, Toronto
University of Toronto group, Toronto: Forestry Building; Pathological Building
Trinity College School, Port Hope

Findlay & Foulis, Niagara Falls
Additon to Collegiate Institute, Sault Ste. Marie
Technical School, Sault Ste. Marie
Loretto Abbey, Toronto

Albert J. Lothian, Windsor
Assumption College, Classroom Building, Sandwich
St. Thomas Public School, Riverside
St. Joseph School (public school), Ford City

Marani, Lawson & Paisley, Toronto
St. Andrews College group, Aurora: Dunlap Hall; classrooms; gymnasium; swimming pool; dormitories and dining hall; Headmaster's residence
Ridley College Lower School group, St. Catharines dormitories; Headmaster's residence; dining hall

Nichols, Sheppard and Masson, Windsor (also Chatham)
The John Campbell Public School, Windsor
Gordon McGregor Public School, Ford City
Hugh Beaton Public School, Walkerville

Sproatt & Rolph, Toronto
Hart House, Toronto University, Toronto
Burwash Hall, Victoria University, Toronto
Bishop Strachan School, Toronto

F. W. Warren, Hamilton
W. H. Ballard Public School, Hamilton
Lord Allenby School, Hamilton
Saltfleet High School, Stoney Creek

Watt & Blackwell, London (also Toronto)
University of Western Ontario, School of Medicine, London
Ryerson Public School, London
London Technical and Art School, London (A. Nutter, Associated)

John Wilson, Collingwood
Collegiate Institute, Collingwood
Addition to Collegiate Institute, Barrie
Continuation School, Erin

QUEBEC

Louis N. Audet, Sherbrooke
College de Levis, Levis
Mont Notre Dame Convent, Sherbrooke
Seminary, Three Rivers
(Asselin & Denoncourt, Associate Architects)

Alcide Chaussé, Montreal
Convent, Granby
St. Brigide's School, Montreal
Maisonneuve School, Montreal

Chas. David, Montreal
St. Cunegonde Academy, Montreal
St. Augustin of Cantorbery School, Montreal
Holy Cross School, Montreal

Lamontagne, Gravel & Brassard, Chicoutimi
Couvent du Bon Pasteur, Chicoutimi
Agrandissement du Séminaire de Chicoutimi
Couvent de Kénogami, Kénogami

Nobbs & Hyde, Montreal
McGill University group, Montreal: Pathological Institute; Pulp and Paper Institute
High School, Bannantyne Avenue, Verdun

J. Aime Poulin, Sherbrooke
Ste. Therese School, Sherbrooke
Catholic High School, Drummondville
St. Joseph, Drummondville Village

Viau & Venne, West Montreal
Mother-House, Sisters of the Holy Names, Outremont
St. Mary's Academy and College, Windsor
Academie Marie-Rose, Montreal

SASKATCHEWAN

F. H. Portnall, Regina
Thomson Public School, Regina
Crescent Public School, Regina
St. Chads College (Maple Leaf Hostel), Regina

J. H. Puntin, Regina
Sacred Heart College and Chapel, Regina
Luther College Teaching and Administration Building, Regina
Regina College, Music and Arts Building, Regina

See also Landscape Architects for University and School Projects, pages 180–181.

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Genasco Trinidad Bonded Roofings are applied by Genasco approved roofing contractors, who are experts in applying our roofings in accordance with the specifications.

There is a Genasco Trinidad Bonded Roofing for every type of building—a roof for flat or steep roofs—a roof for use over boards, concrete, gypsum or tile.

Genasco Trinidad Bonded Roofings, made with alternate layers of Trinidad Lake Roofing Asphalt—nature's own waterproofer—and layers of Genasco all-rag felt, now include the following:

Genasco Trinidad 20-year Bonded Roofing with slag, crushed stone or gravel surfacing. Class A Underwriters' Laboratories Classification—guaranteed twenty years by The United States Fidelity and Guaranty Company, Baltimore, Maryland.

Genasco Trinidad 15-year Bonded Roofing with slag, crushed stone or gravel surfacing. Class A Underwriters' Laboratories Classification—guaranteed fifteen years by The United States Fidelity and Guaranty Company, Baltimore, Maryland.

Genasco Trinidad 10-year Bonded Roofing with smooth surface. Guaranteed ten years by The United States Fidelity and Guaranty Company, Baltimore, Maryland.

Our Engineering Department will be glad to work with you on any of your roofing problems—will be glad to give you their opinion as to the best type of roof for any type of building you have under consideration. Write for your copy of the "Genasco Trinidad Bonded Roof" specification booklet.

Genasco

Reg. U. S. Pat. Off.

TRINIDAD BONDED ROOFING

PARENTAL SCHOOL, NEW YORK CITY, THE FLOORS OF WHICH ARE COVERED WITH GENASCO ASPHALT MASTIC

SPECIFICATIONS FOR GENASCO ASPHALT MASTIC FLOORS

Base—The concrete or other base shall be prepared ready to receive the mastic surfacing . . . inches below and parallel to the final finished floor grade with proper slopes established to take care of any required drainage. (If the floor is to be laid over wood, first lay one thickness of Genasco Wall Lining. Flash at all posts, walls, etc., with a paint coat of Genasco Priming Paint.)

Materials—The block shall be a Genasco Asphalt mastic as produced by THE BARBER ASPHALT COMPANY. The flux shall be Native Trinidad Lake Asphalt of proper penetration for the work involved. The sand shall be fairly sharp, free from loam or any foreign matter of vegetable origin, and shall be well graded from coarse to fine, all passing a 10-mesh sieve and not over 3% passing a 200-mesh sieve. The coarse aggregate shall be a gravel, crushed trap rock, crushed gravel or other crushed sound stone, all passing a ⅜-inch screen and retained on a 10-mesh sieve.

A formula giving the proportions of mastic block, flux, sand and coarse aggregate for the proposed mixture to be submitted to the engineer or architect, together with a sample of the sand and coarse aggregate which the contractor proposes to use.

Construction—On the base, as above specified, lay a Genasco Asphalt Mastic Floor, not less than . . . inches in thickness, laid in . . . layers. The Genasco Asphalt Block shall be brought to the site of the work, broken and melted in suitable kettles, together with the proper amount of flux, sand and coarse aggregate (the two latter previously dried and heated) in proportions satisfactory to the engineer or architect. THE BARBER ASPHALT COMPANY will give its opinion, if requested, as to formulæ for mastic mixes for various conditions, provided samples of the aggregate to be used for the work are submitted for examination.

After sufficient heating and stirring, the mixture shall be spread on the established base to a uniform thickness of . . . inches and worked under wooden floats until it is free from voids. A half-and-half mix of fine sand and portland cement shall then be sprinkled on the floor and the surface rubbed smooth.

The mastic mixture is to be laid in approximately 6-foot strips. In making joints the hot mastic shall overlap the preceding strip about 4 inches so that the edge of the cold strip will become soft, thus allowing the finisher to make a perfect joint after the surplus material spread over the cold strip has been cut away.

Note: Thickness of mastic to be according to conditions and service to which the floor is subjected. Where acid conditions exist, Genasco Acid-Proof Mastic Block and silicious aggregate must be used. Where the mastic is to be more than 1 inch thick, it is to be applied in two layers of . . . inches, each with joints in top layer so made as not to coincide with the joints in the bottom layer. Top layer only is to be rubbed with the sand-portland cement mix.

Genasco

ASPHALT MASTIC

Section XII

SUPERINTENDENTS OF SCHOOLS IN PLACES OF 10,000 POPULATION AND OVER

In the following list are included all of the 748 cities having, according to the 1920 Federal Census, a population of 10,000 or over. The names of the superintendents of schools have been furnished during April and May, 1929, to The American School and University by the State Departments of Public Instruction. Replies have been received from all of the 48 states, thus making the list complete and authentic for purposes of reference.

City	*Superintendent*
Alabama	
Anniston	S. E. Alverson
Bessemer	J. E. Bryan
Birmingham	Charles B. Glenn
Dothan	C. C. Moseley
Florence	F. T. Appleby
Gadsden	C. A. Donehoo
Mobile	W. C. Griggs
Montgomery	W. R. Harrison
Selma	P. M. Munro
Tuscaloosa	J. M. Burnett
Arizona	
Phoenix	J. D. Loper
Tucson	O. E. Rose
Arkansas	
Fort Smith	J. W. Ramsey
Hot Springs	H. H. Haley
Little Rock	R. C. Hall
North Little Rock	W. E. Phipps
Pine Bluff	J. R. Allen
Texarkana	P. N. Bragg
California	
Alameda	William G. Paden
Bakersfield	L. E. Chenoweth
Berkeley	Dr. Lewis W. Smith
Eureka	George B. Albee
Fresno	O. S. Hubbard
Glendale	R. D. White
Long Beach	W. L. Stephens
Los Angeles	Frank A. Bouelle
Oakland	Willard E. Givens
Pasadena	John A. Sexson
Pomona	Emmett Clark
Richmond	Walter T. Helms
Riverside	Ira C. Landis
Sacramento	Charles C. Hughes
San Bernardino	C. Ray Holbrook
San Diego	Walter R. Hepner
San Francisco	J. M. Gwinn
San Jose	Walter L. Bachrodt
Santa Ana	John A. Cranston
Santa Barbara	Paul E. Stewart
Santa Cruz	Karl F. Adams
Stockton	Ansel S. Williams
Vallejo	Elmer L. Cave
Venice (now a part of Los Angeles)	
Colorado	
Boulder	W. V. Casey
Colorado Springs	Hobart M. Corning
Denver	E. L. Threlkeld
Greeley	G. E. Brown
Pueblo	J. F. Keating
Trinidad	Gilbert S. Willey
Connecticut	
Ansonia	Richard T. Tobin
Bridgeport	Worcester Warren
Bristol	Karl A. Reiche
Danbury	F. K. Watson
Derby	Frank M. Buckley
Hartford	Fred D. Wish, Jr.
Meriden	C. C. Thompson
Middletown	V. B. Moody
Naugatuck	H. E. Chittenden
New Britain	S. H. Holmes
New Haven	Frank H. Beede
New London	Warren A. Hanson
Norwalk	John Lund
Norwich	E. J. Graham
Stamford	J. A. Ewart
Torrington	G. J. Vogel
Waterbury	M. C. Donovan
Willimantic	E. E. Case
Delaware	
Wilmington	David A. Ward
District of Columbia	
Washington	Frank W. Ballou
Florida	
Jacksonville	R. B. Rutherford, County Supt.
Key West	M. E. Russell, County Supt.
Miami	Charles M. Fisher, County Supt.
Pensacola	William Tyler, County Supt.
St. Petersburg	G. M. Lynch, County Supt.
Tampa	W. D. F. Snipes, County Supt.
Georgia	
Albany	R. E. Brooks
Athens	T. N. Gaines
Atlanta	W. A. Sutton
Augusta	L. B. Evans
Brunswick	R. D. Eadie
Columbus	R. B. Daniel
La Grange	F. F. Rowe
Macon	W. P. Jones
Rome	B. F. Quigg
Savannah	O. B. Strong
Valdosta	A. G. Cleveland
Waycross	Ralph Newton
Idaho	
Boise	C. F. Dienst
Pocatello	J. M. McDonald
Illinois	
Alton	W. R. Curtis
Aurora	C. M. Bardwell
Belleville	H. V. Calhoun
Berwyn	E. W. Martin
Bloomington	S. K. McDowell
Blue Island	J. E. Lemon
Cairo	J. W. Carrington
Canton	R. W. Hyndman
Centralia	R. V. Jordan
Champaign	Leon N. Neulen
Chicago	W. J. Bogan
Chicago Heights	F. T. Goodier
Cicero	G. A. Schwebel
Danville	C. E. Vance
Decatur	William Harris
East St. Louis	D. Walter Potts
Elgin	R. W. Fairchild
Evanston	J. R. Skiles
Forest Park	R. C. Mueller
Freeport	F. W. Phillips
Galesburg	O. O. Young
Granite City	G. P. Frohardt
Herrin	John R. Creek
Jacksonville	B. F. Shafer
Joliet	H. A. Perrin
Kankakee	A. P. Johnson
Kewanee	Charles Bruner
La Salle	J. B. McManus
Lincoln	D. F. Nichols
Mattoon	H. B. Black
Maywood	E. La Rowe
Moline	L. A. Mahoney
Murphysboro	Harry R. Row
Oak Park	W. J. Hamilton
Ottawa	C. J. Byrne
Pekin	C. B. Smith
Peoria	E. C. Fisher
Quincy	J. H. Steiner
Rockford	Frank A. Jenson
Rock Island	J. J. Hagan
Springfield	J. H. Winstrom
Streator	H. B. Fisher
Urbana	M. L. Flaningham
Waukegan	John S. Clark
Indiana	
Anderson	W. A. Denny
Bloomington	R. N. Tiery
Clinton	G. W. McReynolds
Crawfordsville	A. D. Montgomery
East Chicago	J. W. Asbury
Elkhart	J. F. Wiley
Elwood	W. F. Smith
Evansville	J. O. Chewning
Fort Wayne	L. C. Ward
Frankfort	J. W. Stott
Gary	W. R. Wirt
Hammond	L. L. Caldwell
Huntington	J. M. Scudder
Indianapolis	Charles F. Milier
Jeffersonville	E. G. McCullum
Kokomo	C. V. Haworth
La Fayette	A. E. Highley
La Porte	E. B. Wetherow
Logansport	D. W. Horton
Marion	E. E. Day
Michigan City	Milo C. Murray
Mishawaka	P. C. Emmons
Muncie	F. E. Allen
New Albany	H. A. Buerk
New Castle	E. J. Llewelyn
Peru	G. W. Youngblood
Richmond	W. G. Bate
South Bend	W. W. Borden
Terre Haute	G. C. Carroll
Vincennes	Virgil Eikenberry
Whiting	J. H. Hoskinson
Iowa	
Boone	G. S. Wooten
Burlington	W. G. Brooks

City	Superintendent
Cedar Rapids	Arthur Deamer
Clinton	C. W. Brown
Council Bluffs	Theodore Saam
Davenport	Frank L. Smart
Des Moines	J. W. Studebaker
Dubuque	F. G. Stevenson
Fort Dodge	K. D. Miller
Fort Madison	A. I. Tiss
Iowa City	I. A. Opstad
Keokuk	R. L. Reid
Marshalltown	W. F. Shirley
Mason City	Frank T. Vasey
Muscatine	E. A. Sparling
Ottumwa	R. F. Hannum
Sioux City	M. G. Clark
Waterloo	C. W. Kline
Kansas	
Arkansas City	C. E. St. John
Atchison	T. B. Portwood
Chanute	L. H. Petit
Coffeyville	A. I. Decker
Eldorado	J. F. Hughes
Emporia	L. A. Lowther
Fort Scott	V. M. Liston
Hutchinson	J. W. Gowans
Independence	J. H. Clement
Kansas City	M. E. Pearson
Lawrence	W. W. Curfman
Leavenworth	I. J. Bright
Parsons	R. H. Hughes
Pittsburg	M. M. Rose
Salina	W. S. Heusner
Topeka	A. J. Stout
Wichita	L. W. Mayberry
Kentucky	
Ashland	J. D. Falls
Covington	G. O. Swing
Henderson	C. E. Dudley
Lexington	Guy Whitehead
Louisville	B. W. Hartley
Newport	A. D. Owens
Owensboro	J. L. Foust
Paducah	L. J. Hanifan
Louisiana	
Alexandria	W. J. Avery, Parish Supt.
Baton Rouge	W. B. Hatcher, Parish Supt.
Lake Charles	Ward Anderson
Monroe	E. L. Neville
New Orleans	Nicholas Bauer
Shreveport	E. W. Jones
Maine	
Auburn	George R. Gardner
Augusta	Everett Perkins
Bangor	I. W. Small
Bath	C. D. Wilson
Biddeford	C. A. Weed
Lewiston	C. W. Bickford
Portland	W. B. Jack
Waterville	C. E. Glover
Maryland	
Annapolis	George Fox, County Supt.
Baltimore	D. E. Weglein
Cumberland	Charles L. Kopp, County Supt.
Frederick	G. L. Palmer, County Supt.
Hagerstown	B. J. Grimes, County Supt.
Massachusetts	
Adams	R. S. Smith
Amesbury	R. R. Barr
Arlington	C. A. Moody
Attleboro	Lewis A. Fales
Belmont	F. A. Scott
Beverly	S. H. Chace
Boston	J. E. Burke
Braintree	C. E. Fisher
Brockton	J. F. Scully
Brookline	Oscar Gallagher
Cambridge	M. E. Fitzgerald
Chelsea	G. C. Francis
Chicopee	J. J. Desmond, Jr.
Clinton	T. F. Gibbons
Danvers	Ivan G. Smith
Dedham	J. C. Anthony
Easthampton	H. D. Casey
Everett	Fairfield Whitney
Fall River	H. L. Belisle
Fitchburg	E. W. Robinson
Framingham	B. J. Merriam
Gardner	F. T. Reynolds
Gloucester	E. W. Fellows
Greenfield	....
Haverhill	A. L. Barbour
Holyoke	W. R. Peck
Lawrence	B. M. Sheridan
Leominster	W. H. Perry
Lowell	H. J. Molloy
Lynn	H. S. Gruver
Malden	F. G. Marshall
Marlboro	E. P. Carr
Medford	H. H. Howes
Melrose	H. H. Stuart
Methuen	L. H. Conant
Milford	A. O. Caswell
Natick	F. W. Kingman
New Bedford	A. P. Keith
Newburyport	Starr M. King
Newton	U. G. Wheeler
North Adams	G. C. Bowman
Northampton	F. K. Congdon
Northbridge	H. J. Phipps
Norwood	L. W. Grant
Peabody	Albert Robinson
Pittsfield	J. F. Gannon
Plymouth	A. B. Handy
Quincy	J. N. Muir
Revere	C. F. Lindstol
Salem	G. M. Bemis
Saugus	J. W. Lambert
Somerville	E. W. Ireland
Southbridge	F. E. Corbin
Springfield	Z. E. Scott
Taunton	W. A. Mowry
Wakefield	W. B. Atwell
Waltham	W. H. Slayton
Watertown	W. H. Price
Webster	C. R. Stacey
Westfield	C. D. Stiles
West Springfield	J. R. Fausey
Weymouth	P. T. Pearson
Winchester	J. J. Quinn
Winthrop	E. R. Clarke
Woburn	G. I. Clapp
Worcester	W. S. Young
Michigan	
Adrian	C. H. Griffey
Alpena	G. H. Curtis
Ann Arbor	O. W. Haisley
Battle Creek	W. G. Coburn
Bay City	G. L. Jenner
Benton Harbor	S. C. Mitchell
Detroit	Frank Cody
Escanaba	R. E. Cheney
Flint	C. V. Courter
Grand Rapids	L. A. Butler
Hamtramck	M. R. Keyworth
Highland Park	I. M. Allen
Holland	E. E. Fell
Ironwood	Du Fay R. Rice
Ishpeming	C. L. Phelps
Jackson	E. O. Marsh
Kalamazoo	E. H. Drake
Lansing	J. W. Sexton
Marquette	W. W. Whitman
Monroe	C. W. Crandell
Muskegon	M. W. Longman
Owosso	E. J. Willman
Pontiac	James H. Harris
Port Huron	L. A. Packard
Saginaw	Chester F. Miller
Sault Ste. Marie	G. G. Malcolm
Traverse City	Charles L. Poor
Wyandotte	F. W. Frostic
Minnesota	
Austin	S. T. Neveln
Duluth	L. Young
Faribault	H. H. Kirk
Hibbing	J. W. Richardson
Mankato	H. Enkema
Minneapolis	C. R. Reed
Rochester	G. H. Sanberg
St. Cloud	R. H. Brown
St. Paul	S. O. Hartwell
Virginia	W. G. Bolcom
Winona	R. B. Irons
Mississippi	
Biloxi	A. L. May
Columbus	H. H. Ellis
Greenville	E. E. Bass
Hattiesburg	W. I. Thames
Jackson	E. L. Bailey
Laurel	R. H. Watkins
Meridian	H. M. Ivy
Natchez	W. H. Braden
Vicksburg	J. P. Carr
Missouri	
Cape Girardeau	J. A. Whiteford
Carthage	J. Lucas Campbell
Columbia	W. I. Oliver
Hannibal	L. McCartney
Independence	E. B. Street
Jefferson City	W. F. Knox
Joplin	J. A. Koontz
Kansas City	George Melcher
Moberly	M. F. Beach
St. Joseph	F. H. Barbee
St. Louis	J. J. Maddox
Sedalia	H. W. Hunt
Springfield	H. P. Study
Montana	
Anaconda	W. K. Dwyer
Billings	M. C. Dietrich
Butte	A. H. Douglass
Great Falls	S. D. Largent
Helena	John Dietrich
Missoula	I. B. Fee
Nebraska	
Grand Island	C. R. Gates
Hastings	A. H. Staley
Lincoln	M. C. Lefler
North Platte	W. J. Braham
Omaha	J. H. Beveridge
Nevada	
Reno	B. D. Billinghurst
New Hampshire	
Berlin	C. M. Bair
Concord	L. J. Rundlett
Dover	J. E. Wignot
Keene	W. C. T. Adams
Laconia	J. S. Gilman
Manchester	L. P. Benezet
Nashua	C. H. Noyes
Portsmouth	H. L. Moore
New Jersey	
Asbury Park	A. E. Kraybill
Atlantic City	C. B. Boyer
Bayonne	P. H. Smith
Belleville	G. R. Gerard
Bloomfield	Edgar J. Stover
Bridgeton	Chester Robbins
Camden	J. E. Bryan
Carteret	Barbara V. Hermann
Clifton	G. J. Smith
East Orange	C. J. Scott
Elizabeth	I. T. Chapman
Englewood	W. J. White
Garfield	W. H. Steegar
Gloucester City	A. M. Bean
Hackensack	W. A. Smith
Harrison	C. A. McGlennon
Hoboken	D. S. Kealey
Irvington	R. L. Saunders
Jersey City	J. A. Nugent
Kearney	H. Dressel
Long Branch	C. T. Stone
Millville	Homer Bortner
Montclair	F. G. Pickell
Morristown	J. B. Wiley
New Brunswick	F. J. Sickles
Newark	J. H. Logan
Orange	J. B. Patrick
Passaic	F. S. Shepherd
Paterson	J. R. Wilson
Perth Amboy	S. E. Shull

City	Superintendent
Phillipsburg	G. A. Kipp
Plainfield	F. W. Cook
Rahway	W. F. Little
Summit	J. B. Dougall
Trenton	W. J. Bickett
Union City	A. O. Smith
W. Hoboken	(Now a part of Union City)
West New York	Harry L. Bain
West Orange	S. C. Strong
New Mexico	
Albuquerque	John Milne
New York	
Albany	C. E. Jones
Amsterdam	W. H. Lynch
Auburn	G. F. Barford
Batavia	C. P. Wells
Beacon	E. D. Hewes
Binghamton	D. J. Kelly
Buffalo	E. C. Hartwell
Cohoes	E. Hayward
Corning	S. L. Howe
Cortland	F. E. Smith
Dunkirk	F. R. Darling
Elmira	H. O. Hutchinson
Fulton	G. R. Bodley
Geneva	W. L. Houseman
Glens Falls	A. W. Miller
Gloversville	H. W. Langworthy
Herkimer	L. W. Bills
Hornell	H. S. Dodge
Hudson	M. C. Smith
Ilion	E. P. Watkin
Ithaca	F. D. Boynton
Jamestown	M. J. Fletcher
Johnstown	E. L. Ackley
Kingston	M. J. Michael
Lackawanna	W. J. Breene
Little Falls	H. D. Hervey
Lockport	R. B. Kelley
Middletown	E. H. Burdick
Mount Vernon	W. H. Holmes
Newburgh	S. J. Gage
New Rochelle	A. Leonard
New York	W. J. O'Shea
Niagara Falls	J. F. Taylor
No. Tonawanda	D. E. Batcheller
Ogdensburg	A. J. Laidlaw
Olean	W. C. Greenawalt
Oneida	A. H. Covell
Oneonta	G. J. Dann
Ossining	E. A. Barto
Oswego	F. Leighton
Peekskill	F. J. Bohlmann
Plattsburg	G. M. Elmendorf
Port Chester	A. G. Frost
Port Jervis	A. H. Naylor
Poughkeepsie	W. C. Moon
Rensselaer	W. S. Clark
Rochester	H. S. West
Rome	G. R. Staley
Saratoga Springs	H. Crandall
Schenectady	A. J. Stoddard
Syracuse	G. C. Alverson
Tonawanda	F. K. Sutley
Troy	A. Eldred
Utica	J. A. DeCamp
Watertown	R. C. Burdick
Watervliet	W. Richmond
White Plains	J. W. Lumbard
Yonkers	L. F. Hodge
North Carolina	
Asheville	W. L. Brooker
Charlotte	H. P. Harding
Durham	F. M. Martin
Gastonia	W. P. Grier
Goldsboro	R. Armstrong
Greensboro	C. W. Phillips (acting)
High Point	T. W. Andrews
New Bern	H. B. Smith
Raleigh	H. F. Srygley
Rocky Mount	R. M. Wilson
Salisbury	G. B. Phillips
Wilmington	O. A. Hamilton
Wilson	K. R. Curtis
Winston-Salem	R. H. Latham
North Dakota	
Fargo	J. G. Moore
Grand Forks	J. C. West
Minot	L. A. White
Ohio	
Akron	G. E. McCord
Alliance	B. F. Stanton
Ashtabula	M. S. Mitchell
Barberton	U. L. Light
Bellaire	J. V. Nelson
Bucyrus	E. N. Dietrich
Cambridge	H. R. Hick
Campbell	W. M. Coursen
Canton	J. H. Mason
Chillicothe	W. L. Miller
Cincinnati	R. J. Condon
Cleveland	R. G. Jones
Cleveland Heights	F. L. Wiley
Columbus	J. G. Collicott
Coshocton	A. C. Pence
Cuyahoga Falls	W. H. Richardson
Dayton	P. C. Stetson
East Cleveland	W. H. Kirk
East Liverpool	C. S. McVay
Elyria	R. C. Maston
Findlay	I. F. Matteson
Fremont	C. A. Hudson
Hamilton	Darrell Joyce
Ironton	Harper C. Pendry
Kenmore	C. E. McCorkle
Lakewood	Julius E. Warren
Lancaster	J. J. Phillips
Lima	R. E. Offenhauer
Lorain	D. J. Boone
Mansfield	H. H. Helter
Marietta	H. L. Sullivan
Marion	G. A. Bowman
Martins Ferry	W. L. Kocher
Massillon	H. R. Gorrell
Middletown	R. W. Solomon
New Philadelphia	F. P. Geiger
Newark	O. J. Barnes
Niles	R. J. Kiefer
Norwood	C. W. Johnson
Piqua	G. C. Dietrich
Portsmouth	Frank Appel
Salem	J. S. Alan
Sandusky	F. J. Prout
Springfield	F. M. Shelton
Steubenville	R. L. Erwin
Tiffin	C. A. Krout
Toledo	C. S. Meek
Warren	H. B. Turner
Youngstown	J. J. Richeson
Zanesville	C. T. Prose
Oklahoma	
Ardmore	J. J. Godbey
Bartlesville	C. O. Haskell
Chickasha	T. T. Montgomery
Enid	E. D. Price
Guthrie	W. A. Greene
McAlester	M. J. Hale
Muskogee	C. K. Reiff
Oklahoma City	J. R. Barton
Okmulgee	J. R. Holmes
Sapulpa	W. M. Chambers
Shawnee	H. G. Faust
Tulsa	P. P. Claxton
Oregon	
Astoria	A. C. Hampton
Eugene	H. R. Goold
Portland	C. A. Rice
Salem	G. W. Hug
Pennsylvania	
Allentown	H. W. Dodd
Altoona	R. E. Laramy
Aliquippa	H. R. Vanderslice
Ambridge	S. Fausold
Beaver Falls	Floyd Atwell
Berwick	M. E. Houck
Bethlehem	W. H. Weiss
Braddock	T. G. McCleary
Bradford	J. F. Butterworth
Bristol	H. E. James
Butler	J. A. Gibson
Canonsburg	F. W. McVay
Carbondale	J. J. Crane
Carlisle	J. W. Potter
Carnegie	N. L. Glasser
Carrick	(Now a part of Pittsburgh)
Chambersburg	U. L. Gordy
Charleroi	T. L. Pollock
Chester	G. H. Weiss
Coatesville	C. O. Benner
Columbia	P. E. Witmeyer
Connellsville	B. B. Smith
Dickson City	P. M. Brennan
Donora	T. M. Gilland
Dubois	C. J. Aldefer
Dunmore	J. R. Gilligan
Duquesne	C. H. Wolford
Easton	J. C. Bay
Erie	J. C. Diehl
Farrell	W. W. Irwin
Greensburg	T. S. March
Harrisburg	C. H. Garwood
Hazelton	A. D. Thomas
Homestead	Port Eckles
Jeanette	E. W. Long
Johnstown	S. J. Slawson
Lancaster	H. E. Gress
Lebanon	S. O. Rorem
Mahanoy City	H. A. Oday
McKeesport City	J. B. Richey
McKees Rocks	T. K. Johnston
Meadville	W. P. Norton
Monessen	C. R. McClelland
Mt. Carmel	W. M. Yeingst
Nanticoke	A. P. Diffendafer
New Castle	C. C. Green
New Kensington	E. T. Chapman
Norristown	H. O. Dietrich
North Braddock	H. E. Means, Supervising Prin.
Oil City	R. A. Baum
Old Forge	B. T. Harris
Olyphant	J. A. Dempsey
Philadelphia	E. C. Broome
Phoenixville	M. L. Peters
Pittsburgh	W. M. Davidson
Pittston	D. J. Cray
Plymouth	H. S. Jones
Pottstown	S. M. Stauffer
Pottsville	C. E. Toole
Punxsutawney	F. S. Jackson
Reading	Landis Tanger
Scranton	....
Shamokin	J. Howerth
Sharon	W. D. Gamble
Shenandoah	A. J. Ratchford
Steelton	C. S. Davis
Sunbury	W. A. Geesey
Swissvale	C. C. Kelso
Tamaqua	F. G. Horner
Uniontown	M. D. Proctor
Warren	P. W. M. Pressell
Washington	J. C. Stiers
West Chester	W. L. Philips
Wilkes-Barre	H. C. Zeiser
Wilkinsburg	W. C. Graham
Williamsport	A. M. Weaver
York	R. O. Stoops
Rhode Island	
Bristol	W. C. Hobbs
Central Falls	J. L. Hanley
Cranston	J. K. Fenner
Cumberland	Irving C. Mitchell
East Providence	J. R. D. Oldham
Newport	H. W. Lull
Pawtucket	W. A. Newell
Providence	I. O. Winslow
Warwick	E. T. Wyman
West Warwick	J. F. Deering
Woonsocket	J. F. Rockett
South Carolina	
Anderson	E. C. McCants
Charleston	A. B. Rhett
Columbia	A. C. Flora
Florence	J. W. Moore
Greenville	J. L. Mann
Spartanburg	Frank Evans
South Dakota	
Aberdeen	M. P. Gaffney
Sioux Falls	A. A. McDonald

City	*Superintendent*	*City*	*Superintendent*	*City*	*Superintendent*
Tennessee		Waco	B. B. Cobb	*West Virginia*	
Bristol	R. B. Rubins	Wichita Falls	J. W. Cantwell	Bluefield	E. C. Wade
Chattanooga	W. T. Robinson			Charleston	S. E. Weber
Jackson	C. B. Ijams	*Utah*		Clarksburg	J. A. Jackson
Johnson City	C. E. Rogers	Ogden	W. Karl Hopkins	Fairmont	Otis G. Wilson
Knoxville	H. P. Shepherd	Provo	Charles A. Smith	Huntington	Clarence L. Wright
Memphis	R. L. Jones	Salt Lake City	G. N. Child	Martinsburg	L. W. Burns
Nashville	H. C. Weber			Morgantown	R. C. Smith
		Vermont		Moundsville	John C. Shreve
Texas		Barre	Carroll H. White	Parkersburg	H. E. Odgers
Abilene	R. D. Green	Burlington	Lyman C. Hunt	Wheeling	F. L. Teal
Amarillo	W. A. McIntosh	Rutland	W. W. Fairchild		
Austin	A. N. McCallum			*Wisconsin*	
Beaumont	M. E. Moore	*Virginia*		Appleton	Ben J. Rohan
Brownsville	G. W. Gotke	Alexandria	R. C. Bowton	Ashland	I. O. Hubbard
Cleburne	Emmett Brown	Bristol	Roy Bowers	Beloit	F. E. Converse
Corpus Christi	Mary Carroll	Charlottesvile	James G. Johnson	Eau Claire	P. G. W. Keller
Corsicana	H. D. Fillers	Danville	G. L. H. Johnson	Fond du Lac	L. P. Goodrich
Dallas	N. R. Crozier	Lynchburg	E. C. Glass	Green Bay	I. H. McIntire
Del Rio	J. C. Cochran	Newport News	J. H. Saunders	Janesville	L. R. Creutz
Denison	F. B. Hughes	Norfolk	C. W. Mason	Kenosha	G. F. Loomis
El Paso	A. H. Hughey	Petersburg	Henry G. Ellis	La Crosse	G. M. Wiley
Fort Worth	M. H. Moore	Portsmouth	Harry A. Hunt	Madison	R. W. Bardwell
Galveston	E. G. Littlejohn	Richmond	Albert H. Hill	Manitowoc	Hugh S. Bonar
Greenville	L. C. Gee	Roanoke	D. E. McQuilkin	Marinette	C. E. Hulten
Houston	E. E. Oberholtzer	Staunton	L. F. Shelburne	Milwaukee	Milton C. Potter
Laredo	Wm. P. Galligin			Oshkosh	Charles C. Bishop
Marshall	E. C. Deering	*Washington*		Racine	F. M. Longanecker
Palestine	Bonner Frizzell	Aberdeen	George B. Miller	Sheboygan	H. W. Kircher
Paris	J. G. Wooten	Bellingham	D. E. Wiedman	Stevens Point	P. M. Vincent
Port Arthur	G. M. Sims	Everett	R. E. Cook	Superior	Lulu Pickett
Ranger	R. F. Holloway	Hoquiam	H. C. Crumpacker	Waukesha	G. O. Banting
San Angelo	Felix E. Smith	Seattle	Thomas R. Cole	Wausau	S. B. Tobey
San Antonio	Marshall Johnston	Spokane	O. C. Pratt	West Allis	T. J. Jones
Sherman	L. T. Cook	Tacoma	William F. Geiger		
Temple	L. C. Proctor	Vancouver	C. W. Shumway	*Wyoming*	
Texarkana	H. W. Stillwell	Walla Walla	W. M. Kern	Casper	R. S. Hicks
Tyler	J. M. Hodges	Yakima	A. C. Davis	Cheyenne	A. S. Jessup

Books and Pamphlets Issued by State Departments of Education with Special Reference to School-Building Planning and Construction

MANY state departments of education have been vitally concerned with the problems of planning and constructing new schoolhouses. Their interest has led to the preparation of many books and pamphlets in which schoolhousing standards are discussed and illustrated. These pamphlets also frequently include the states' requirements which must be followed in the planning of school buildings. The significant reports issued by various states in this field are listed below:

Arizona.—State Department of Public Instruction, Phoenix, Ariz.
Bulletin, 1927. Containing Educational Measures Passed by the Eighth Regular Session of the Arizona State Legislature.
Eighth Biennial Report of the State Superintendent of Public Instruction to the Governor of the State of Arizona. For the Period July 1, 1924, to June 30, 1926.

Arkansas.—State Department of Public Instruction, Little Rock, Ark.
Four Years with the Public Schools in Arkansas, 1923-1927. A Place to Work—A Place to Play.

Connecticut.—State Board of Education, Hartford, Conn.
Laws Relating to the Construction of Schoolhouses—and suggestions relating thereto. Second Edition. 1926.

Delaware.—State Department of Public Instruction, Dover, Del.
Minimum Standards for School Buildings and Sites. 1927.

Idaho.—State Department of Education, Boise, Idaho.
Bulletin of Education. School House Plans. One-, Two- and Three-Room Buildings. June, 1927.

Illinois.—State Department of Public Instruction, Springfield, Ill.
Aids to Teachers and School Directors of the One-Teacher School. 1927.

Indiana.—State Department of Public Instruction, Indianapolis, Ind.
Laws and Procedure in Schoolhouse Construction.

Kansas.—State Board of Education, Topeka, Kans.
Detail of Requirements for Standardization of Rural and Graded Schools.

Maryland.—State Department of Education, Baltimore, Md.
Requirements for Standard Elementary Schools. August 20, 1926.

Massachusetts.—Department of Education, Boston, Mass.
Department of Public Safety. Regulations Relating to the Erection, Alteration and Inspection of Schoolhouses.
Annual Report of the Schoolhouse Department. 1915.

Michigan.—State Department of Public Instruction, Lansing, Mich.
School Buildings, Equipment and Grounds: For City, Graded and Rural Agriculture School Districts, 1922.

Missouri.—State Department of Public Instruction, Jefferson City, Mo.
Plans for School Buildings and Equipment in Missouri. 1920.

Nebraska.—State Department of Public Instruction, Lincoln, Nebr.
Rural School Standards.

(Continued on page 448)

Section XIII

Participation of State Departments of Education and Other State Agencies in Planning and Supervising Local School-Building Development

BY N. L. ENGELHARDT

PROFESSOR OF EDUCATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

Assisted by

WM. W. ANDREW, LEON DEMING, CARL GRIFFEY, AND L. R. SIDES

IN the planning of buildings for a public school system, it frequently is desirable to know the degree to which the state department of education has provided for participation and cooperation. The accompanying tabulation segregates the character of the supervision given by the state and its representative agencies under three headings. The first item indicates the action which the state board may be expected to take. The second item shows the part played by the state superintendent of schools as the official spokesman of the state department of education. In the third part will be found indications of the assistance or guidance which other state agencies will give. The form of tabulation has necessitated the abbreviation of the statements covering these responsibilities, but the degree and character of participation are clearly shown in each state.

ABBREVIATED STATEMENT OF STATES' PARTICIPATION IN SCHOOL-BUILDING CONSTRUCTION

ALABAMA

State Board of Education
Approves rules and regulations for the hygienic, sanitary, and protective construction of school buildings.
State Superintendent, Dr. R. E. Tidwell
1. Prepares and submits to state board rules and regulations for hygienic, sanitary, and protective construction of school buildings.
2. Recommends for condemnation buildings that violate these regulations.

ARIZONA

State Board of Education
No jurisdiction whatever in regard to buildings erected by districts.
State Superintendent, Dr. C. O. Case
1. Prepares and submits to state board rules and regulations for hygienic, sanitary, and protective construction of school buildings.
2. Recommends for condemnation buildings that violate these regulations.

Other Agencies
Board of health issues regulations.

ARKANSAS

State Board of Education
Has a division of school grounds and schoolhouse planning.
Director—
Prepares plans for 1-6-teacher buildings.
Prepares school ground plans.
Checks architect's plans.
Advises school officials.
State supervisor visits local units upon invitation.
State Superintendent, Dr. J. P. Womack
No legal provision for approval.

CALIFORNIA

State Superintendent of Education, Vierling Kersey
Division of schoolhouse planning passes on plans submitted by all districts outside larger cities; is called into consultation by city districts, and controls other situations by surveys.
Other Agencies
County superintendent of schools approves plans except in incorporated cities. Plans of local boards must be submitted to him.

COLORADO

State Superintendent of Public Instruction, Dr. Katherine L. Craig
School building handled by local boards of education.

CONNECTICUT

State Board of Education
Has a bureau of building construction and maintenance which approves plans, though not because law requires it. Chief inspects school buildings for safety.
Publishes standards for guidance of local boards.
Has consulting architect to whom plans are referred, though not by law.
Assists local communities in building surveys.
State Commissioner, Dr. A. B. Meredith

DELAWARE

State Board of Education
Outside Wilmington prepares a tentative program of school building to submit to local boards.
Hears comments and suggestions thereon.
Creates standards with effect of law, governing hygienic, sanitary, and protective construction; selection, arrangement, and maintenance of sites; condemns school buildings.
Has approval of plans and specifications.
State Superintendent, Dr. H. V. Holloway
Other Agencies
Legislature has created a state school-building act.
There is a state school-building account.
State school-building commission for each district.
Plans approved by commission.
Buildings built by commission.
Construction supervised by commission.
Board of health has to approve drinking water and sewage disposal.

FLORIDA

State Superintendent of Public Instruction, Dr. W. S. Cawthon
Has oversight, charge, and management of all matters pertaining to public schools, school buildings and grounds.

GEORGIA

State Superintendent of Schools, Dr. Mell L. Duggan
Furnishes plans and specifications for school-building guidance in local units.
Supervisor of schoolhouse construction prepares plans for 1-4-teacher buildings; prepares school ground plans; checks architect's plans; advises school officials.
Other Agencies
County superintendent and county board of education approve plans.

IDAHO

State Board of Education
Standardization of:
Sanitary appliances
School furniture
School equipment and supplies
School buildings
Issues plans for 1-2-3-room buildings.
Requires approval of plans.
State Commissioner, Dr. W. O. Vincent
Other Agencies
Department of public welfare has to cooperate with state board of education in its duties regarding schools.
County superintendent has power to require local trustees to conform to rules of state board "if there is money enough."
County board of health is responsible for sanitation in schools.

ILLINOIS

State Superintendent of Public Instruction, Dr. Francis G. Blair
Prepares, with advice of state board of health, state architect, and state fire marshal, specifications for minimum requirements in heating, ventilation, lighting, seating, water-supply, toilets, safety against fire.
These have force of law.
Other Agencies
State architect is required to assist the state superintendent of schools.
Enforcement of law is in the hands of county superintendents and local authorities.
County superintendent approves plans according to standards of state board.
Advises school officials in details of construction, but only on standards is it necessary to follow him.
County superintendent inspects buildings.
Board of Education required to submit plans to county superintendent.

INDIANA

State Superintendent of Public Instruction, Dr. Roy P. Wisehart
Other Agencies
Local school trustees erect buildings. Plans and specifications must be submitted to state board of health for approval of sanitation and hygiene; to state board of accounts for adequacy of specifications and fair competition.
State board of health issues standards.

IOWA

State Superintendent of Public Instruction, Dr. Agnes Samuelson
Shall prepare and publish, when deemed necessary, a pamphlet containing suitable plans and specifications.

KANSAS

State Board of Education
"No provision in the laws to prevent the erection of undesirable buildings or to compel the discontinuance of buildings that should be abolished immediately."
Has adopted standardization of rural schools involving among other things: out-building; school-building equipment.
State Superintendent, Dr. George A. Allen, Jr.
Approves plans submitted voluntarily by local authorities.

KENTUCKY

State Board of Education
Approves plans made by state superintendent and issues same for local community's guidance.
State Superintendent, Dr. W. C. Bell
With advice of board of health, prepares plans for approval of state board comprehending sanitary and protective construction.
Approves plans submitted by county boards and boards of trustees of graded schools.
Other Agencies
Advisory with state superintendent.

LOUISIANA

State Superintendent of Education, Dr. T. H. Harris
Approves plans which board of health regulations require submitting to him.
Other Agencies
Board of health regulations require submittal of plans to:
Parish superintendent of schools
State superintendent of schools
Parish health officer
for hygienic or necessary provision for ventilation, heating, light, fire protection.

MAINE

State Commissioner of Education, Dr. Augustus O. Thomas
No school building can be built or repaired without his approval.
Provides plans for 1-4-room buildings free of cost.
Issues minimum requirements so that local units will be able to meet his approval of plans.
Other Agencies
No school building can be built or repaired without approval of board of health.

MARYLAND

State Board of Education
Elementary schools. Standardization includes grounds, buildings, lighting, heating and ventilation, library, equipment.
Has issued "Standards for School Buildings" as a guide to county superintendents.
State Superintendent, Dr. Albert S. Cook
Sites and plans must be submitted to him for approval; additions to buildings also.
Issues certificate without which no building can be erected (except Sec. 20, Chap. 506, 1916).
Comprehends size and arrangement.
Other Agencies
Plans must be submitted to board of health for approval of sewage-disposal arrangements and plumbing.

MASSACHUSETTS

State Commissioner of Education, Dr. Payson Smith
Assistants of superintendent do much in consulting with local committees. Loan slides.
Other Agencies
Department of public safety must approve all plans.
Department of public safety issues regulations.

MICHIGAN

State Department of Education
Must approve all plans for school buildings and additions to old ones before any money may be spent on construction.
Has issued standards.
Makes surveys, free of cost, of local situations before local board has decided what program should be; upon invitation.
State Superintendent, Dr. Webster H. Pearce
Has authority to inspect and condemn.

MINNESOTA

State Board of Education
State aid for building of consolidated schools.
Prescribes rules for schoolhouse construction, including therein rules of the board of health relative to sanitary standards for toilets, water-supply, and disposal of sewage.
State Commissioner, Dr. James M. McConnell
Examines all plans and specifications with power of approval or otherwise.
He may condemn buildings under his own or the high school board's rules.
Other Agencies
The law authorizes county superintendent to advise local school boards in regard to buildings and ventilation, but, as a matter of fact, the county superintendent does not exercise this power. All such questions come to commissioner of education.

MISSISSIPPI

State Board of Education
Furnishes plans and specifications for rural buildings free of charge.
State Superintendent, Dr. W. F. Bond

MISSOURI

State Board of Education
"State department renders all possible assistance."
State Superintendent, Dr. Charles A. Lee

MONTANA

State Board of Education
Publishes a bulletin on 1- and 2-room rural buildings, containing drawings and plans.
State Superintendent, Dr. Elizabeth Ireland
Plans are furnished local boards by the board of health.

NEBRASKA

State Superintendent of Public Instruction, Dr. Charles W. Taylor

NEVADA

State Board of Education
Prepares plans and specifications for rural school buildings and distributes same.
State Superintendent, W. W. Anderson

NEW HAMPSHIRE

State Commissioner of Education, Dr. Ernest W. Butterfield

NEW JERSEY

State Board of Education
Advice and consent to appointment of building inspector by commissioner.
Approves plans which must be submitted.
Has set up a code.
Has a business division with superintendent and director of school buildings.
State Commissioner, Dr. Charles H. Elliott
May instruct county and city superintendents as to constructing schoolhouses and furnishing same.
Appoints an inspector of buildings.
Other Agencies
County superintendent has power "to note" conditions of schoolhouses, sites, etc., and advise with local boards in respect to construction, heating and ventilation, and lighting.
Local boards provide school buildings.
Commissioner of charities and corrections shall examine and report on school buildings at request of commissioner of education.

NEW MEXICO

State Superintendent of Public Instruction, Dr. Atanasio Montoya

NEW YORK

State Education Department
Has a division of school buildings and grounds with a chief.
Has set up standards.
Board issues a pamphlet of information for local authorities.
Makes inspections of sites and school conditions before definite action is taken by local authority.
Advises with superintendent, principals, and boards in regard to needs and best way to meet them.
Examines preliminary plans.
State Commissioner, Dr. Frank P. Graves
In cities of 3rd class, all plans and specifications must receive commissioner's approval.
He cannot approve unless plans conform to laws.
No tax can be levied until plans are approved.

NORTH CAROLINA

State Board of Education
Has a director of schoolhouse planning.
There is a special building fund from which loans are made when plans are approved.
State department has a set of standards.
Has plans purchased from architects which it distributes free.
Has an assistant who devotes much time to the laying out, planting and beautifying of school grounds.
State Superintendent, Dr. A. T. Allen
All plans must be submitted to state superintendent for approval, except in special charter schools.
Other Agencies
Plans must also be submitted to insurance commission for approval, also to state board of health.

NORTH DAKOTA

State Superintendent of Public Instruction, Bertha R. Palmer
Plans must be submitted to and approved by superintendent.

OHIO

State Director of Education, Dr. J. L. Clifton
Other Agencies
Has a state building code (very elaborate).
All plans must be approved by chief inspector of workshops and factories, except in cities having regularly organized building inspection departments.
District health commissioner checks plans for water-supply and sanitary arrangements. State department of health may make surveys and issue orders as to these matters.

OKLAHOMA

State Superintendent of Public Instruction, Dr. John Vaughan
Law provides that he prepare a book of plans (with no appropriation). It has never been enforced.
Other Agencies
Standard buildings law.

OREGON

State Superintendent of Education, Dr. C. A. Howard
Issues booklet giving suggested plans for one-, two-, and three-room school buildings. No legal provision for the approval of the state department.
Other Agencies
Plans for one-room schools must be approved by county school superintendents.
County superintendents advise with the school boards relative to the construction, warming, ventilating, and arrangement of schoolhouses.

PENNSYLVANIA

State Council of Education
Has a director of bureau of school buildings.
Prescribes rules and regulations and power to take such action as it may deem expedient to promote physical and moral welfare of school children.
Department code—
Required to approve plans in 2nd, 3rd, 4th class districts.
Supervises preparation of plans in local communities if asked to do so.
Submits, if asked, suggestive sketches.
State Superintendent, Dr. John A. H. Keith
Other Agencies
State code.
Art commission passes on architectural design.
Department of labor and industry passes on fire and panic protection.

RHODE ISLAND

State Commissioner of Education, Dr. Walter E. Ranger
Commissioner has placed pictures and plans in his annual report.

SOUTH CAROLINA

State Superintendent of Education, Dr. James H. Hope
Plans must be submitted to and approved by him.
Inspects (or by deputy) all new buildings, and certificate of approval is necessary before same can be used.
Other Agencies
Has a state building code.

SOUTH DAKOTA

State Superintendent of Public Instruction, Dr. E. C. Giffen
Plans must be approved by him and show heating and ventilation scheme.

TENNESSEE

State Commissioner of Education, Dr. P. L. Harned

TEXAS

State Board of Education
Special state aid fund.
State Superintendent, Dr. S. M. N. Marrs
Other Agencies
School-building code.
Plans must be submitted as follows for approval: (1) in a common school district—to the county superintendent; (2) independent district and city or town—to superintendent of schools.
These agencies report to state department what they have done and transmit evidence.

UTAH

Conditions reported uncertain

State Board of Education
There are two department building codes.
First is in abeyance though not exactly discarded.
They have operated under the second one 2 years.
State Superintendent, Dr. C. N. Jensen
Is required to formulate a code to govern preparation of plans by local communities.
May hire an architect to examine plans or inspect buildings.

VERMONT

State Board of Education
Rural schools are standardized with "points" on buildings, grounds, equipment.
Plans "should be" submitted to state board.
Issues plans and pictures.
State Commissioner, Dr. Clarence H. Dempsey
Other Agencies
Plans "must be" submitted to board of health.

VIRGINIA

State Board of Education
Has a division of school buildings.
Prepares plans and specifications for smaller towns and cities.
Supervises construction free of charge.
Minimum standards have been set up and approved.
Cooperates with local boards in:
(a) Preparing preliminary plans.
(b) Getting out final plans.
(c) Present at opening of proposals.
(d) Inspection every 2 weeks during first stages of construction, additional upon request of contractor or local board.
State Superintendent, Dr. Harris Hart

WASHINGTON

State Board of Education
Has been given "some power" through law on "wider use of school plant."
State Superintendent, Dr. N. D. Showalter
Other Agencies
County superintendents approve plans in 2nd and 3rd class districts.

WEST VIRGINIA

State Board of Education
In districts with population less than 5,000, plans must be submitted for approval to board or its agent.
State Superintendent of Free Schools, Dr. George M. Ford

WISCONSIN

State Department of Public Instruction
Under a cooperative agreement between the industrial commission and the department, all school plans are sent to the latter by the commission for checking and suggestive criticisms looking towards the erection of first class buildings.
Helps local communities by making suggestive plans for all types of buildings to serve as a basis for extended work by commercial architects.
Service has been extended to cover expert advice on heating, ventilation, lighting.
The department develops complete plans and specifications and gives architectural service for one- and two-room rural schools on request.
Inspects all types of schools with a view to improving housing conditions and facilities; makes complete building surveys in all types of communities on request.
State Superintendent, John Callahan
Other Agencies
The law requires submission of all school plans to industrial commission. This checking refers primarily to the application of the state building code and pays attention primarily to construction, safety and sanitation.

WYOMING

State Board of Education
Prescribes standards which may include rules and regulations for the sanitary and hygienic construction of schoolhouses and the location and selection of grounds.
State Superintendent, Dr. Katharine A. Morton

The legislatures participate in school-building construction by the passage of laws fixing requirements which regulate, in the aggregate of all the states, sites, planning, construction, fire protection, heating and ventilation, and sanitation. It is almost impossible to give "an all inclusive detailed picture of the status" of this type of control. States in which there is the most detailed regulation are the following: Idaho, Illinois, Indiana, Maine, Massachusetts, Minnesota, New Jersey, New York, North Dakota, Ohio, Pennsylvania, South Dakota, Vermont, Virginia, West Virginia, Wisconsin.

Books and Pamphlets Issued by State Departments of Education with Special Reference to School-Building Planning and Construction

(Continued from page 444)

New Jersey.—State Department of Education, Trenton, N. J.
Building Code—Comprising the Law and the Rules and Regulations of the State Board of Education Concerning Public School Buildings. July, 1925.
School-Building Survey—State of New Jersey. 1922.

New York.—State Department of Education, Albany, N. Y.
Rural School Buildings and Grounds: Care, Maintenance and Improvement of Rural Schools. 1927.
School Buildings and Grounds: Laws, Rules, and Information Relating to School-Building Construction. 1926.
School Buildings, Sites and School District Bonds. 1926.
School Buildings and Grounds. Volume 3 of the Eleventh Annual Report of the New York State Department of Education.

North Carolina.—State Department of Public Instruction, Raleigh, N. C.
Schoolhouse Planning in North Carolina. Annual Report.

North Dakota.—State Department of Public Instruction, Bismarck, N. Dak.
General School Laws—Comprising the Laws in Force Pertaining to Public Schools. 1927.

Ohio.—State Department of Education, Columbus, Ohio.
State Building Code. Part I—Administration. Part II—School Buildings.

Oklahoma.—State Department of Public Instruction, Oklahoma City, Okla.
School Laws. 1927.

Pennsylvania.—Department of Public Instruction, Harrisburg, Pa.
Rules and Regulations in Regard to Schoolhouse Construction. 1917.

South Carolina.—State Department of Education, Columbia, S. C.
High School Manual. 1927.

Texas.—State Department of Public Instruction, Austin, Texas.
School Grounds, School Buildings and Their Equipment. 1922.

Utah.—State Department of Public Instruction, Salt Lake City, Utah.
School-Building Code. 1922.

Vermont.—State Department of Education, Montpelier, Vt.
Public Schools of Vermont and Their Improvement. 1925.

Classified List of Products and Services

Numbers appearing after names refer to the pages of The American School & University on which illustrations or data may be found with regard to the products manufactured or services rendered.

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443 Fourth Avenue,

New York, N. Y.

PLEASE NOTE THAT NO POSTAGE STAMPS ARE NECESSARY FOR MAILING

THE FORMAN COMPANY

Tablets of Imperishable Bronze

48 West Broadway, NEW YORK CITY

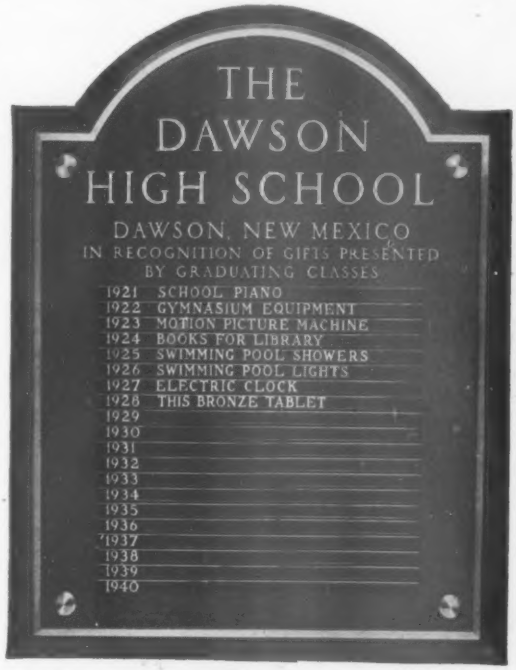
BRONZE TABLETS

We specialize in the making of imperishable bronze tablets for schools, colleges, churches, libraries, etc.; whether it be a simple memorial plate or an elaborate tablet requiring the most artistic modeling, we can assure you of the finest results. Having the best of artisans at our command, results **must** be satisfactory. All our work is executed with the greatest care and precision, and we use only the highest-grade materials. We guarantee our products to equal the best. Prices are as low as consistent with strictly first-class work.

We will furnish designs of our own creation when desired, or when drawings are furnished we will follow them without deviation. To all details we devote the utmost care.

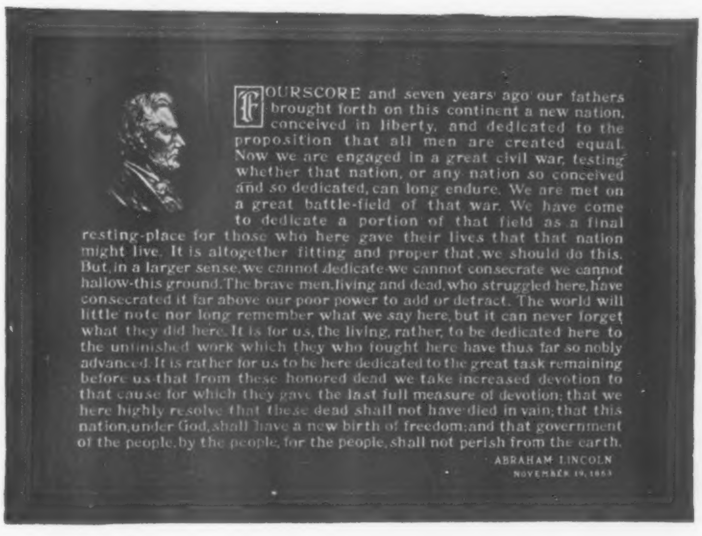
When writing for designs send the approximate size of the tablet desired and the reading matter to be displayed; we will then submit a rough suggestion for your inspection, making as many changes as necessary until the desired result is obtained.

Write for our booklet showing bronze tablets for all purposes.



LINCOLN'S GETTYSBURG ADDRESS

cast in bronze, as illustrated below, is 24 in. high by 32 in. long, center panels 20 by 28 inches. It is furnished with or without border, or with a different border treatment if desired. Any school in the land would be proud of this tablet.



CAST BRONZE LETTERS

The use of bronze letters for the displaying of titles is becoming more and more popular. In the many years of our business career we have accumulated a large variety of patterns in full alphabets (some of them designed by the leading architects of the country) from which we cast at short notice. Sizes range from less than one inch to twenty in height.

Send us the size of the space where the letters are to go, the reading matter to be displayed and size of letter desired, and we will lay out to the best advantage, submitting either scale or full-size drawing and quotation. If letters are wanted that require special patterns, we can furnish them, working from drawings furnished or submitting our own designs. We will either set the letters when desired, or send full-size template and instructions for the use of the local school mechanic. Setting is a simple matter if instructions are followed.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY

EAST PITTSBURGH, PENNA.

Offices in all principal cities throughout the United States

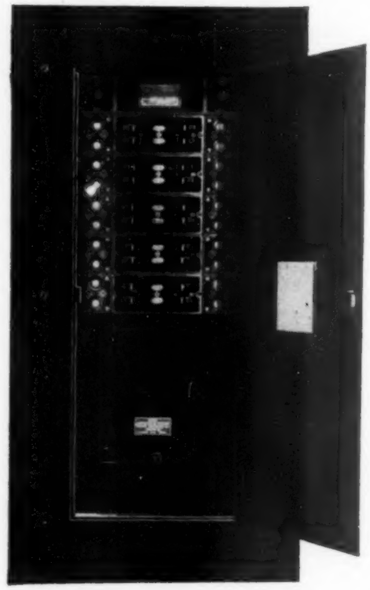
PANELBOARDS

Westinghouse Types ST and NST panelboards possess many unique features that make them ideal for all lighting applications.

Great flexibility of application is obtained because the unit-sections, made up of cold-molded, fire and moisture-proof asbestos, are of standard dimensions. These sections are made in three pieces, thus making replacement easy and economical.

All branch switches are 30-ampere, 250-volt heavy duty, quick-make and quick-break tumbler-type switches. The mechanism is positive in action and the switch can be operated in case of failure of the spring. Micarta arc quenchers are provided to quickly quench any arc drawn by the opening switch.

The switches and fuses may be removed for inspection without disturbing the front. Adjustable corner irons, indicating trim clamps and rabbet return molding,—Westinghouse features—that save installation time and expense are furnished with these boards.



Complete information on these and other types of Westinghouse panelboards can be obtained from the nearest Westinghouse office.

MICARTA TRAYS FOR THE CAFETERIA AND LABORATORY

These trays unlike metal trays are easily kept hygienically clean and therefore are exceptionally well suited for use in school and college cafeterias and restaurants.

Also because moisture, most acids and chemicals have no effect on Micarta trays, they are used in laboratory work where ordinary trays prove unsatisfactory.

Micarta trays have a soft satin finish that time and use will not mar. Made in walnut burl, black and tan in sizes: 9½ x 12½ in., 13⅝ x 17⅝ in., 15⅜ x 20¾ in., 16½ x 22½ in.

For Lighting see page 129; for Commercial Cooking see page 342.

THE THOMAS-SMITH COMPANY

CANTON, OHIO

BRANCHES IN PRINCIPAL CITIES

Electrically and Mechanically Operated Fire Alarm Systems
Electric Bells and Signals

PRODUCTS

Manually Operated Fire Alarm Systems.

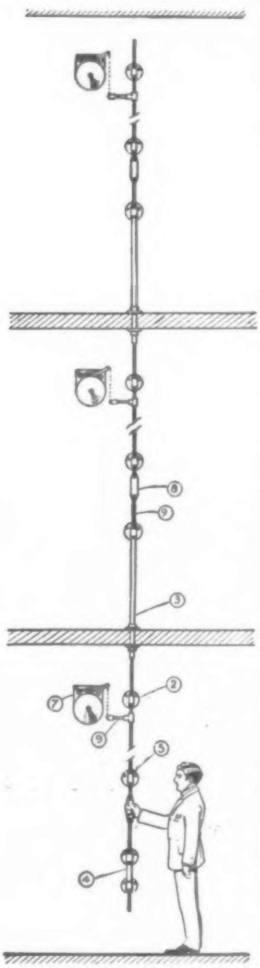
Electrical and Mechanical Operated Fire Alarm Systems.

Enclosed Type Vibrating Bells for Direct Current or Alternating Current.

Combination Electrical and Mechanical Bells, Aluminum Grids and Traffic Lights.

FIRE ALARM SYSTEMS

The Thomas-Smith Alarm System for Schools and buildings is approved by architects and conforms with state codes.



MANUALLY OPERATED FIRE ALARM SYSTEM

The Thomas - Smith Fire Alarm System is the only one with rigid rod connecting the alarms of the different floors of the building.

The supports are adjustable to take care of uneven walls or misalignment of succeeding floors.

The floor tube is adjustable to allow for floors of various thickness and extends up from floor to prevent rod from being bent.

Spring is totally enclosed and positive in action.

All supports and tubes are bushed with brass.

Enamel baked on. Red, Black or Buff finish.

The best bells made.

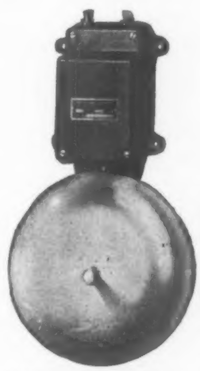
Handles of polished brass lacquered.

Operating rods of steel tube with chain stem properly proportioned and balanced.

Wood mats supplies for under supports and gongs.

Manufactured in both manually operated system and electrically and mechanically operated system which differ only in the method of operation.

Write for catalog and price list.



NOS. 6 JR. AND 6 D. C. AND NOS. 7 JR. AND 7 A. C. VIBRATING BELLS

THOMAS-SMITH LIBERTY BELLS

Thomas - Smith Liberty Bells cover all types and sizes from 3 inch to 20 inch, vibrating or single stroke, 110 volt, 220 volt, all standard transformer voltages, battery operation, direct or alternating current. Weatherproofed types furnished if desired at small additional cost.

All Thomas-Smith Liberty Bells embody the very finest of workmanship and materials and are approved by the National Board of Fire Underwriters.

Liberty Vibrating Bells are of the plunger hammer type. The No. 6-Jr. D. C. and No. 7-Jr. A. C. are made in 3", 4", 5" and 6" sizes and the No. 6 D. C. and No. 7 A. C. in 6", 8", 10", 12", 14", 16", 18" and 20" sizes.

The No. 12 A. C. Enclosed Type Single Stroke Liberty Bells are made in 5", 6", 8", 10", 12", 14", 16", 18" and 20" sizes. These bells contain no springs or moving parts except the plunger.

Nos. 86 D. C. and 87 A. C. Combination Electrical and Mechanical Bells combine the regular vibrating or single stroke line with the mechanical attachment. These bells are made in the 8" 10", 12" and 14" sizes and are especially adapted for fire signals.

THOMAS-SMITH ALUMINUM GRIDS

These grids are made to fit all sizes of bells and fit snugly at the base of mechanism over the shell and are bird-proof.

CATALOG

Write for catalog of Thomas - Smith Alarm Systems, Liberty Bells and Traffic Lights.

NOS. 86 OR 87 LIBERTY BELLS

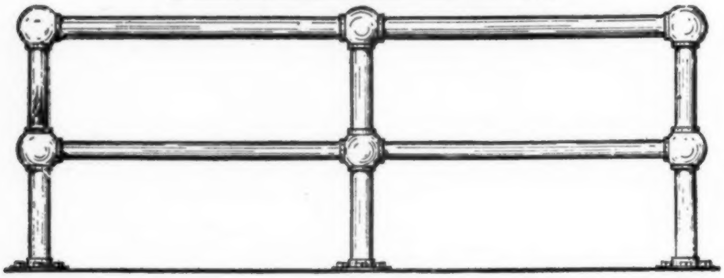
Combination Electrical or Mechanical Bells

PIPE RAILING CONSTRUCTION CO., INC.

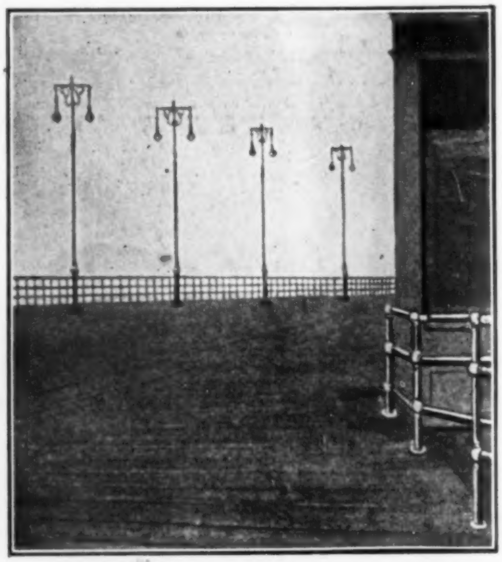
Pipe Railings for Iron or Concrete Stairs, Grandstands, Board Walks, Runways, Backstops, Goal Posts, Etc.

51-69 Sixth Street

LONG ISLAND CITY, N. Y.



This company is organized to manufacture and assemble pipe and fittings for every possible service except plumbing and steam fitting. With tons of black and galvanized pipe in stock, we can promise almost immediate shipment of any order, large or small.

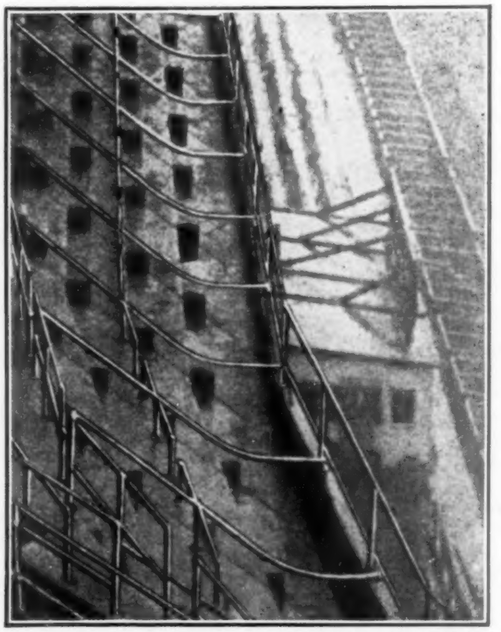


CONEY ISLAND BOARD-WALK RAILING

We manufacture and assemble:

Pipe Railing for Bridges
Pipe Railing for Culverts
Pipe Railing for Iron Stairs
Pipe Railing for Concrete Stairs
Pipe Railing for Grandstands
Pipe Railing for Board Walks
Pipe Railing for Runways
Pipe Structure for Backstops and Goal Posts
Pipe Columns, Pipe Racks, etc.

Above is shown a small section of the Coney Island Board-Walk Railing. In constructing this railing, it was necessary to take care of expansion, contraction and vibration. Our special fittings took care of this, and the job is considered one of the finest pipe railing jobs in the United States.



STADIUM AT AMERICAN LEAGUE BASEBALL PARK, NEW YORK CITY—25,000 FEET OF PIPE RAILING FURNISHED

Above is a view of a section of the upper stand of the stadium at the baseball park of the American League at New York City. Twenty-five thousand feet of pipe railing were furnished and erected by us on this stand.

On every pipe railing job the material is shipped, posts are assembled, horizontal rails are cut, threaded and marked for erection. Let us quote you prices, or send you our illustrated circular.

SERVICISED PREMOULDED PRODUCTS, INC.

53 West Jackson Boulevard, CHICAGO, ILL.

GENERAL DISTRIBUTORS

For Products Manufactured by

SERVICISED PRODUCTS CORPORATION

Distributors and Dealers in the Principal Cities

The architectural problems involved in our half a billion dollar annual school construction program nowhere have more skillful attention than that given by the American architect. And no one appreciates more that, aside from design, the selection of materials for adaptability, durability and for waterproofing and damp proofing of walls, roofs, walks and floors is of supreme importance.

The use of Servicised Products will in an outstanding way cut down the enormous annual maintenance load by providing materials which lengthen the life of school structures, protect them largely against damage from water, vibration or stresses induced by shifts in temperature. In short, they dampen the effect of destructive agencies.

Look over the list of premoulded fibrated asphalt and rubber material given below, alphabetically arranged, and note the many ways in which Servicised engineers have anticipated needed improvements in School Construction.

Accoustical Material
Asphalt Planking, Flooring (non-skid, waterproof), **Waterproofing Sheets**
Bituminous-Fiber Sheets (for Decking)
Expansion Joints (Premoulded) for Walls, Buildings, Sidewalks, Pavements
Flashing Blocks
Flooring, Rubber, Asphalt Plank
Insulating Material
Matting, Rubber
Paper, Building, Roofing
Roofing Asphalts
Roofing Felts
Roof Insulation
Roofs Built-Up, Bonded
Rubber Flooring, Matting
Rubber Stair Treads
Rubber Tile
Sound Absorbing Materials
Traffic Markers and Guides, Rubber

SERVICISED Literature Available on All of the above Materials. Send for it.

SERVICISED LOOK FOR IT ON ALL PURCHASES

SERVICISED ENGINEERS AND SERVICISED LABORATORIES, INC., will gladly cooperate in the development of materials for more economical and more permanent school construction.